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ONTARIO AGRICULTURAL COLLEGE

Farm Poultry

With the Results of Some Experiments of Poultry Houses and Fattening Chickens

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INTRODUCTION.

More interest in poultry and poultry products is shown from year to year. Many farmers a few years ago considered poultry as a necessary evil and not in any sense of the word as revenue makers. There are yet a considerable number of this class, but more people are finding that the keeping of poultry is profitable and enjoyable. We now find a large number of farmers keeping from fifty to one hundred hens, who are well pleased with the cash returns from their poultry. There are also a growing number of small farmers who specialize in poultry-keeping profitably, and further there are numerous persons in cities, towns and villages who are making money from poultry.

The writers in the following pages will endeavor to give in a concise form the results of their experience covering a period of more than fifteen years with poultry at this College.

SUCCESS or FAILURE in keeping poultry depends upon breeding, feeding, housing, rearing, sanitation, and general management. All of these factors must be carefully studied. We do not mean to infer that the keeping of poultry is extremely difficult, but we do wish to impress upon our readers that it is no business for a lazy or an indifferent person or one who is not prepared to plan the work carefully and then work to the plan. There are a larger number of individuals in the poultry flock than in most other flocks of live stock kept upon the farm, and the individual unit is frequently lost in the mass. The writers believe poultry production will be found both enjoyable and profitable if the person in charge will do his or her part well, but we would discourage people who are not prepared to work faithfully and systematically. By this we mean success is not likely to be

obtained by careful feeding, etc., for five or six days, and then on the following days forget to feed or water, etc. Where poultry is kept in large numbers, success depends almost entirely upon efficiency.

The general farmer has nearly all the conditions for success and if given reasonable attention poultry-keeping should be one of the revenue producers of the farm.

BREEDS OF POULTRY.

The present high prices of eggs and meat have done much to popularize poultry on the farm, and consequently we are frequently asked as to "What is the best breed of poultry." It is impossible to answer this question, as some breeds are special purpose breeds and others general purpose breeds. There is undoubtedly more difference in strains of the same breed than there is between breeds.

It is not the purpose of the writers to discuss all breeds of poultry in this bulletin, but simply to mention the general characteristics of some of the more popular ones. We shall endeavor to classify these breeds more or less on utility lines rather than according to the usual classification as adopted in various poultry publications. It may be taken as a rule that all breeds that lay brown or tinted shelled eggs will set, hatch, and rear their young, and all breeds which lay white-shelled eggs, with the exception of Dorkings, are non-sitters, and the eggs from these breeds have to be hatched artificially or by hens of other varieties. It will, therefore, be seen that the general purpose breeds lay tinted eggs and are good sitters and mothers.

General Purpose Breeds.

Plymouth Rocks. There are six varieties of this breed—three of which are common—Barred, White, and Buff. The Partridge, Columbian, and Silver Pencilled are not so common. The Barred Plymouth Rock is undoubtedly the most popular variety of fowl among farmers. The best bred-to-lay strains are good winter layers, fair summer layers, make first-class roasters, and fair to good broilers. It is one of the hardiest breeds. The standard weights are: Cock birds, 9½ lbs.; cockerels, 8 lbs.; hens, 7½ lbs.; and pullets, 6½ lbs. Bred-to-lay strains usually run slightly below the standard weights in all sections except cock birds.

Wyandottes. There are several varieties in this breed among which might be mentioned: White, Buff, Silver Laced, Golden Laced, Black Columbian, Partridge and Silver Pencilled. The most popular variety from a commercial standpoint is the White. This breed has practically the same characteristics as the Plymouth Rocks, but is more blocky in type and usually longer in the feather. The feathers are not carried so close to the body as the Rocks. They have rose combs, which by some is supposed to be an advantage in cold climates. Wyandottes make good broilers and good roasters. Some strains are good layers and they make good mothers. The standard weight of these birds is one pound less than those of the Plymouth Rocks.

Rhode Island Reds. There are two varieties of this breed, single comb and rose comb. As compared with the Plymouth Rocks and Wyandottes they are longer in appearance and not so massive. They were originated by the farmers of the State of Rhode Island, and are very popular in that State. They have also grown in popularity in this country to such an extent that they now rival the Plymouth

Rocks and Wyandottes. They are hardy, good winter layers, and fair summer layers. In color they are a rich, bright red, with black tails, and more or less black in the wings. During warm weather our experience has been that they are more given to incubating than the two breeds mentioned above. The standard weights of this breed are: Cock birds, 8½ lbs.; cockerels, 7½ lbs.; hens, 6½ lbs., and pullets, 5 lbs.

Orpingtons. This general purpose breed differs from those mentioned in that they have white legs and skin; the other breeds having yellow legs and yellow skin. The common varieties of this breed are: Buff, White, and Black. At the present time there are probably more Buff Orpingtons bred than any other variety, but the White may outrival the Buff. The Blacks are being bred more by the fanciers than by the farmers, for the reason that their black plumage and dark-colored legs are somewhat against them for market purposes. This breed is among the best winter layers; makes good roasters and broilers, but is probably more given to incubating during warm weather than either the Rocks or the Wyandottes. The standard weights are about one pound per bird above the Plymouth Rocks. For general farm use they might be more profitably bred with less weight, for the reason that the largest birds are usually somewhat leggy and rough in appearance when weighing 4 to 5 lbs. When one wants very large roasters, weighing from 7 to 8 lbs. each or more, the larger birds, of course, would be better.

Dorkings. This is one of the oldest English breeds, and is popular in some districts. They are a large breed, long in the body and short in the legs. By many they are considered to be weak in constitution, although our experience would not bear this out, entirely. They lay large white eggs, and are good sitters and mothers. They are white fleshed and white legged. Their peculiarity is that they have five toes. This is, at times, a disadvantage, especially when the fowls have to scratch in straw where there is more or less binder twine, which is apt to get around the extra toe, and thereby occasionally fastening both feet together. This is not a very serious objection. Where there is high, dry ground and plenty of range, and a person fancies the Dorking color or type, they are worthy of consideration.

Meat Breeds.

Brahmas. The feathered-legged breeds are not very extensively kept. The most popular of these is the Brahma. This breed is very hardy, and lays very large brown eggs. They are rather slow to mature and the feathers on the legs are not altogether desirable from a farmer's standpoint, in that they are apt to get wet and freeze easily. Brahmas make the best roasters, but are somewhat slow to mature, and the females, in our experience, have not been very good layers, although there are some females that do well. This breed is yellow skinned.

Langshans. Langshans are also of the feathered-leg breed, but have white skin. They are longer in the legs than the Brahmas and are not so heavy.

Games. By many the Game would not be considered a chicken suitable to farmers. The exhibition Games, as they are known in the Standard, are altogether too long in the legs and head, and too weak in constitution for the ordinary farmer, but the Cornish Games and what is known as the Old English Game are worthy of consideration. The Cornish Game is a very large, tight-feathered, full-breasted chicken, and probably carries more meat on its breast than any other breed. The objection to the Cornish Game is that it is a poor layer. The English Game, sometimes termed "Pit Game," is a hardy bird. They are fair layers and make fair

roasters. The most serious objection to this breed from a farmer's standpoint is that there is a great tendency among the young cockerels to be very pugnacious. This is sometimes carried to such an extent that they kill one another. Other than this, they make a fairly good farm chicken, especially where the mothers are required to protect their young.

Special Purpose Egg Breeds.

During recent years, commercial egg farms have done much to popularize this class of fowl. Of all the breeds used for this purpose the Leghorn is the most popular, and of the Leghorn the Whites are being kept in the largest numbers. They are good layers during the natural laying season, but in the experience of the writers are liable to suffer more from the cold winter weather than are some of the heavier breeds. They are, otherwise, quite hardy. It is now a well-established fact that on the average a larger number of chicks can be hatched from a given number of eggs from Leghorns than with other breeds and their chicks are easily reared. The young cockerels make good broilers, but are of no use for roasters. Leghorns can no doubt be more successfully kept in large flocks than can the heavy breeds. Cases of commercial farm keeping from three to five hundred in a flock are common, although the fact remains that highest egg yields up to the present are secured from smaller sized flocks. Of the other varieties the Browns, Buffs, and Blacks are most common, but are more popular with the fanciers than with the farmers owing to the color.

Minorcas. There are three varieties of Minorcas. The Rose Comb Black and Single Comb Black are more commonly bred than is the White variety. This breed is larger than the Leghorn, and also lays a larger egg. They have very large combs and wattles.

Anconas. This breed might be termed a speckled or mottled Leghorn. They have all the characteristics of the Leghorn and are black and white in color. This breed is gaining in popularity among the practical poultrymen.

Hamburgs. There are several varieties of this breed. The Black is the most popular. They are inclined to lay an undersized egg. We have found the Blacks to be good layers, and to lay a fair-sized egg. They have rose combs and neat and active in appearance.

SELECTION AND BREEDING.

The object in selecting and breeding is to produce a uniform flock as to the characters desired, or in other words to reduce the percentage of undesirables to the minimum. There may be a vast difference in the objects of the breeders. One may wish a flock uniform as to shape and color; another may want birds that are producers of a large number of eggs; while with others the object may be meat production, or a breeder may desire all the above characters and many more. The more characters desired the slower, ordinarily, will be the progress.

The average farmer, or what is termed utility poultryman, measures a bird by its economical production of eggs and meat.

No matter what the object in view the one essential to all birds is that they have an abundance of constitutional vigor. What is meant by "vigor" is the ability to resist disease or to remain at all times physically fit. Vigor in poultry is as essential as the mainspring is to the clock. Birds low in vigor are nearly always disappointing in making profits or preventing serious loss.

The selection of birds depends upon one's ability to judge the performance possibilities of the specimen. There are certain outward characters that are usually associated with good specimens, but these characters as seen are not always positive. There remains but one way to know the true value of the specimen as a breeder, and this is the progeny test. Some of the best appearing specimens are very disappointing as measured by performance and also by the progeny produced. It is, therefore, evident that where one wishes to make sure and certain progress one must keep accurate records as to parents, age, growth, eggs produced, size and color of eggs, whether the eggs hatch well or poorly, etc. It is equally evident that only a limited number of persons are so situated as to be able to do this, and therefore the larger number must be guided by observation.

Our experience has been that most people are fair judges of vigor. They like the male that is active, proud, with a sprightly appearance; one that will take his own part, also crows rather loudly and frequently. Such birds usually show considerable red color in the side of the shanks, have a bright eye, rather short, well-curved beaks, and the legs are well set under them. Birds with long, narrow heads, and long necks and legs, are frequently, if not always, low in vigor. Usually the eye is somewhat dull and the shanks show but little or no red color. The points are not infallible, but are the best guidance we can offer at present.

Great interest is being taken in egg production, and many people wish to buy males who will produce high-laying pullets or wish to breed the same. Ability along this line is not so easily measured. It is generally true that good layers mature early or commence laying when from one hundred and fifty to two hundred days of age, and as the laying progresses, specimens that have yellow pigment in the shanks gradually lose this color, also that the yellow pigment in white ear-lobed females decreases very much during heavy laying, and furthermore, the pin bones widen and are frequently rather thin and pliable. Again, good laying hens in the late summer and fall wear their old feathers. Yellow-legged breeds are almost white in color of legs, while the hens with new feathers and spick and span appearance are the poor producers. These points are of material assistance in telling which hens have been the good layers. Where one desires to breed from hens that have been the best layers in the flock, and cannot or has not used trap nests, the healthy, robust females that are late to moult and who have lost the color from the shanks have been nearly always good layers.

How to select pullets that will be high layers is a much more difficult problem, and to date we have found no reliable method. It is true that by March, or breeding time, many of the best layers show the same characters as mentioned for hens, and frequently the best layers begin laying rather early in life, but not always.

Where one is breeding to maintain or increase the number of eggs produced great care should be taken not to breed from hens laying very small eggs or birds whose eggs hatch poorly. Pullets that begin laying early or those who mature the earliest in the flock appear to have a tendency to lay rather small eggs. This is not always the case, but it is frequent enough to put one on guard for size of eggs. Again, if one does not get a reasonable hatch, say fifty per cent. or better of the fertile eggs incubated, the males from such hen should be used with extreme caution; furthermore, there is a vast difference in the living power and growth from the individuals in a mating.

Poultry has shown steady improvement for a number of years in nearly all characters, with exception of the hatching power of the eggs and living power of chicks. Our artificial conditions and selections appear to have been not very success-

ful along these lines, possibly owing to the fact that selections along such lines entail considerable labor and usually are not given serious thought. The loss of eggs and chicks in the endeavor to renew the flock are very serious items.

It has been stated that the male has much more to do with the egg production of the daughter than has the female. Our breeding experiments indicate that this is probably true. It would appear that certain high-laying hens, when mated with a good male, can transmit the high-laying character to their sons, but with their daughters they have but little influence. It would, therefore, appear evident that the problem in breeding high-laying pullets is to test the male's ability in regard to this character, and to mate with him high-laying hens so as to secure good cockerels for future breeding. No doubt many good birds are bred by chance; on the other hand it would seem that if the males are to be depended upon very careful records must be kept. We have been working upon such problems for a number of years; first, with the object of determining whether the male was more important than the hen; and further, to supply breeders with a limited number of males of known parentage. According to theory of inherited egg production there are nine classes of males. In order to locate these males at all accurately one must be careful as to the season of hatching, methods of rearing, feeding, housing, etc., or in other words the conditions for egg production must be as near ideal as is within one's knowledge. Without these the results may be unsatisfactory. Careful breeding, where accurate records are kept, is difficult for many, hence the amount of time and money we have spent in testing and recording males and females. Progress is somewhat slow, owing to the fact that one has to learn by hard experience the best methods of attack and recording.

To illustrate the variation in males, below are given the egg production record of the daughters of four males, each representing a different class.

Our experience has been that males of the first class presented are very rare and the second class (while more common) are not numerous. The third class of males presented we have found to be numerous among the sons of good laying hens. As regards the fourth class of males, we have not tested many, but usually breed one each season to maintain a limited number of rather poor laying hens. Such hens are of use to test males of the three other classes mentioned.

Male "A" was bred to twelve females, who produced sixteen daughters, fourteen of which laid thirty-five or more eggs each from November 1st to March 1st, or during the winter period. The two remaining daughters were late hatched, and produced during the winter respectively twenty-two and twenty-eight eggs, and to October 1st of the same year one hundred and sixty and one hundred and forty five eggs. The sixteen daughters produced in the year two thousand nine hundred and sixty eggs, or one hundred and eighty-five eggs each. Our figures would indicate that a healthy hen laying less than one hundred and fifty eggs in twelve consecutive months is to be looked upon as a poor layer. This male should have a daughters laying over one hundred and fifty eggs, but late June hatched birds are uncertain in performance.

This is a very unusual male for breeding high layers. He was not a very good breeder as to numbers produced or hatching power of the eggs, and was, therefore, bred with caution.

Male "B" was bred to nine females and produced twenty-nine daughters twenty-one of which laid over thirty-five eggs during the winter months. The eight remaining pullets produced from two to twenty-three eggs each during the same period. The twenty-one pullets produced an average of one hundred and

ninety-eight eggs each during the year, and the eight remaining pullets averaged one hundred and twenty-three and one-half eggs each.

Bred to	MALE "B."
C54	produced 4 daughters—3 were high winter layers and 1 low.
C100	produced 5 daughters—3 were high winter layers and 2 low.
C36	produced 5 daughters—3 were high winter layers and 2 low.
C29	produced 3 daughters—2 were high winter layers and 1 low.
C280	produced 1 daughter —which was a high layer.
C197	produced 2 daughters—both high layers.
B4	produced 2 daughters—both high layers.
C50	produced 3 daughters—2 were high winter layers and 1 low.
C320	produced 4 daughters—3 were high winter layers and 1 low.
	29 daughters—21 were high winter layers and 8 low.

This male was also a good breeder of strong chicks.

Male "C" was bred to eleven females and produced twenty-eight daughters, twenty-one of which produced thirty-five or more eggs each during the winter period. The remaining seven pullets produced from seven to twenty-seven eggs during the winter period. The twenty-one pullets that performed well during the winter averaged one hundred and eighty eggs for the year, and the seven inferior laying pullets during the winter averaged one hundred and thirty-seven and one-half eggs for the year.

Bred to	MALE "C."
C42	produced 2 daughters—all were high winter layers.
C176	produced 1 daughter —which was a low winter layer.
C19	produced 2 daughters—all were high layers.
C90	produced 1 daughter —which was a high layer.
C726	produced 3 daughters—all were high layers.
C174	produced 6 daughters—three high layers and three low.
C195	produced 4 daughters—all high layers.
C125	produced 1 daughter —which was a high layer.
C67	produced 4 daughters—two were high layers and two low.
C1378	produced 3 daughters—all high layers.
C1352	produced 1 daughter —which was a low layer.
	28 daughters.

This male, when mated to certain hens, produced fifty per cent. v layers, while to other hens he produced all high layers, note C174 and C67. The hens with but one daughter are not of much value in rating a male.

This male was a good breeder of strong chicks.

Male "D." This male was bred to seven pens, whose ancestors were poor layers and the hens mated to him were of similar breeding.

From this mating fifteen daughters were produced, which were handled in the same manner, some in the same pens, as the daughters from the other males.

None of the daughters laid over fifteen eggs in the winter period; seven laid no eggs during the winter period. The best pullet in twelve consecutive months produced one hundred and seventeen eggs, and the average production of the daughters was seventy-six and one-half eggs each.

This male was not bred to high-producing hens, but some of his ancestors were, and the results were hens under the one hundred and fifty egg mark. One of the poorest of these hens was bred in 1916 to a good male, perhaps equal, if not better, than "A," and the five daughters from this mating to late, December 15th, have each laid over thirty-five eggs.

Among the high winter egg producing hens there appears to be two well-defined classes as breeders. The variations among the offspring cannot be noted

from a male such as "A," but may easily be seen in males "B" and "C." That is, some hens mated to males such as "B" or "C" will produce all good laying daughters when mated to other equally as good laying hens produce a percentage of culls. The cockerels from the hen producing all high layers are the better ones to use as breeders, provided they are strong and vigorous.

Any chicken hatched out of season or that has been stunted in growth, or was sick, poorly housed, or badly fed, etc., cannot be expected to perform normal.

Early attention was drawn to the importance of using as breeders the offspring from hens whose eggs hatched well and whose chickens also lived. It is generally well known that range, feeding, housing, etc., have much to do with the living power of the chicks, and also the hatching power of the eggs, but there yet remains the fact that there is a vast difference in individuals under the same conditions. Below is given the hatching and mortality record of three females, half sisters, and who have had identical treatment so far as it is humanly possible to do, and who were in the same breeding pen and mated to the same male:

	Eggs Set	Infertile	Dead Germs	Eggs Hatched	Mortality Among Chicks
No. E63	36	3	14	19	1
No. E50	26	3	17	6	5
No. E95	46	6	6	34	3

These hens have produced over two hundred eggs each in their pullet year, yet one can see at a glance that one is a much more valuable breeder than the others. It is particularly desirable that close attention be paid to these points. The renewal of the flock is at times expensive, and the writers are of the opinion it would be better to go a little slower on increased egg production and try and improve the hatching and living power.

From the foregoing, it will be seen that the breeder's problem is to select birds as breeders that perform well as to egg production, hatching power of eggs and living power of chicks; those that are strong and vigorous and have well-muscled breast. Pay some attention at least to meat qualities. The appearance of the dressed carcass is helped by feeding, but there is much in breeding.

No matter how rigid the selection of breeders there will be more or less undesirable offspring. There are many things in the bird not visible that came from generations back, that, try as we may, some of these will be seen in the offspring. The longer and more rigid the selection the less will likely be the number.

Cross Breeding.

Our experience would be that it is seldom advisable to cross breed. There are instances when it may be advisable, but they are rare. If you should breed, do not breed the cross-bred males. For example of what is likely to happen, below is given a few of the many types, colors, etc., that came from a cross of Barred Rocks and Black Hamburgs, and then the cross-bred cockerels mated to the cross-bred pullets. The first cross produced a rather pretty flock of nice uniform chickens with rose combs and barred-colored plumage, but the succeeding generations were a great variety of shape, color, size and vigor. Breed, at least, a pure-bred male each year. Breeding cross-bred males is dangerous.

Fig. 1.—One of the many types found, the result of a mating of cross-bred fowls.

Fig. 2.—Another type, the result of the breeding of cross-bred fowls.

Fig. 3.—Another type, the result of breeding cross-breds together.

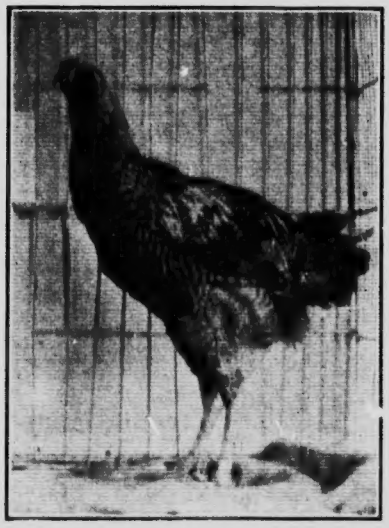


Fig. 4.—Usually when cross-breds are bred together about 25 per cent. of the offspring is very poor, or like this one.

EGG PRODUCTION.

It is generally considered among poultrymen that the production of eggs is the most profitable branch of the business. It must also be conceded that for most people a crop of chickens must be reared annually, and the surplus males and old hens sold, at a profit if possible.

Many people appear to believe that the secret of getting eggs, particularly in winter, is in the feeds given and the method of feeding; others believe the whole problem is in the breed or strain, while others think the housing is the problem to solve. All these are important, but the main reason for poor results, in the opinion of the writers, is a lack of careful work, months before the eggs are wanted. While you are collecting the high-priced winter eggs, one should be making careful plans to secure the crop of pullets for next season.

The factors are feeding, housing, age of stock, strain, possibly breed, the attendant, cleanliness and the weather. All of these may be more or less controlled, with the exception of the weather, and it is perhaps the least important factor.

Some troubles are overcrowding in houses, the stock of mixed ages, that is there are two-year-olds and upwards, yearlings, early pullets and late pullets, also surplus cockerels, and many times dirty, moist houses, wet or dirty litter, etc.

Where eggs in winter are wanted, the early hatched pullet is, without doubt, the one to depend upon. Yearling hens and those older are very rarely good producers during November and December. They are uncertain, even in January and February, and really do not begin to lay well until March. Where the egg production falls below fifteen per cent. during the winter months, one is not making much profit. The age at which most pullets begin laying is from six to seven months, some lay at four and one-half to five months, and others not until eight or nine months of age. This means that if a fifty per cent. egg yield is wanted in November the pullets should be hatched during March or April; May hatched pullets will lay a little but, as a rule, not forty or more per cent. daily.

The attendant has responsibilities. There should not be any neglect on his or her part; careful, constant work and a keen interest in the welfare of the birds. Be regular, and do not neglect the work. A bird that has stopped laying is very hard to start. As they mature, they commence laying; it is the attendant's work to keep them going.

In other portions of the bulletin are discussed housing, feeding, disease, and so forth.

To sum up, in general, the requirements for high egg production are clean, dry, comfortable houses, that are free from direct draughts over the birds, and that are well lighted; the feeding consists of a variety of grains, green food, animal food, grit and shell, which is clean, sweet and wholesome, and is given to the birds regularly and in such quantities that they have all they want to eat before going to roost at night; that the supply of drinking material is clean and abundant; that the attendant is regular in his or her work and is interested in the same; that the birds are bred from good laying ancestors, and that they are hatched and reared well, and are free from disease.

The question of the cost of feeding a hen and the number of eggs that she must produce in order to pay her way are interesting. We have collected data on this question for a number of years, and in general it would indicate that one hundred eggs will pay for the food consumed at market price, allowing thirty cents for labor and ten cents to cover the deaths in the flock. These figures vary a little

from year to year according to the market prices of feeds and eggs. Should the death rate be higher than ten or twelve per cent., ten cents would not be sufficient to cover the loss.

The amount of food consumed varies with breeds, and also is in sympathy with the number of eggs produced. Our figures show that the general purpose breeds, such as Plymouth Rocks, Rhode Island Reds, and Wyandottes, consume from eighty to ninety pounds of grain annually, averaging nearly seven pounds of grain each month. Breeds such as Leghorns or Anconas eat from sixteen to twenty per cent. less, or in other words large birds eat more than small ones, and also birds eat most when laying heavily. The amount of food required cannot be stated in ounces for each day, as birds' appetites vary, similar to human beings; but they should always have sufficient food. The writers are of the opinion that there are more hens too lean to lay than there are too fat. Most very fat hens are poor layers, and are better put on the market rather than fed sparingly to try and condition for laying.

COLLECTIVE RESULTS FOR 138 PULLETS FROM OCTOBER 1ST, 1909, TO SEPTEMBER 1ST, 1910.

Males	Females	Breed	Eggs Laid	Cost	Average Eggs per Bird	Lbs. Grain consumed	Lbs. Milk consumed
2	23	R.I. Reds	3,318	$29 06	144.2	1,662	2,070
2	23	B. Rocks.....	3,341	27 90	145.2	1,585	2,070
2	23	R. I. Reds.....	2,599	25 81	113	1,451	2,027
2	23	B. Rocks.....	3,654	28 44	158.8	1,626	2,027
2	23	B. Rocks (weak).....	2,182	25 18	94.8	1,374	2,289
2	23	B. Rocks (strong)	2,742	29 62	119.2	1,655	2,401
12	138		17,836	$166 01	.....	9,353	12,884

Average cost per dozen eggs for eleven months 11.16c.

Average cost of feeding each bird per month for eleven months 10.06c.

Average number of eggs per bird for eleven months 129.2.

Average amount of food consumed per bird (males included) in eleven months: Grain, 62.35 lbs. or 5.66 lbs. per month; milk, 85.89 lbs. or 7.8 lbs. per month.

COLLECTIVE RESULTS FOR 341 HENS AND PULLETS FROM OCTOBER 1ST, 1910, TO SEPTEMBER 1ST, 1911.

Males	Females	Breed	Eggs Laid	Cost	Average Eggs per Bird	Lbs. Grain consumed	Lbs. Milk consumed
2	55	B. Rock Hens	5,961	$ 74 92	108.3	4,357	4,787
4	92	B. Rock Pullets	11,928	124 02	129.6	7,042	9,195
5	60	B. Orpington Pullets.....	6,401	81 26	106.6	4,805	4,597
6	111	White Leghorn Pullets....	13,504	118 49	121.6	6,739	8,704
2	23	Black Minorca Hens and Pullets.....	1,726	32 34	75.0	1,874	2,118
19	341		39,520	$431 03		24,817	29,401

Average cost per dozen eggs for eleven months 13.08c.

Average cost of feeding each bird per month for eleven months 10.88c.

Average number of eggs per bird for eleven months 115.8.

Average amount of food consumed per bird (males included) in eleven months: Grain, 68.9 lbs. or 6.2 lbs. per month; milk, 81.6 lbs. or 7.4 lbs. per month.

COLLECTIVE RESULTS FOR 266 PULLETS FROM NOVEMBER 1ST, 1912, TO OCTOBER 1ST, 1913.

Males	Females	Breed	Eggs Laid	Cost	Average Eggs per Bird	Lbs. Grain consumed	Lbs. Milk consumed
5	105	B. Rock Pullets.....	13,750	$134 54	130.9	7,860	8,323
1	20	W. Wyandotte Pullets	2,247	27 99	112.3	1,670	1,472
1	19	R. I. Red Pullets	2,352	27 26	123.7	1,618	1,499
1	22	B. Orpington Pullets.....	2,335	31 70	106.1	1,819	2,214
6	100	W. Leghorn Pullets.....	13,306	107 01	133.0	6,340	5,955
14	266		33,990	$328 50	.....	19,307	19,463

Average cost per dozen eggs for eleven months 11.5c.

Average cost of feeding each bird per month for eleven months 10.6c.

Average number of eggs per bird for eleven months 127.7.

Average amount of food consumed per bird (males included) in eleven months: Grain, 68.9 lbs. or 6.2 lbs. per month; milk, 69.5 lbs. or 6.3 lbs. per month.

The following are the averages for the three years:

Average cost per dozen eggs for eleven months 12.1c.

Average cost of feeding each bird per month (males included) eleven months 10.6c.

Average number of eggs per bird for eleven months 122.6.

Average amount of food consumed per bird (males included) eleven months: Grain, 67.6 lbs. or 6.1 lbs. per month; milk, 78.1 lbs. or 7.1 lbs. per month.

Below is given figures as to amounts and kinds of feed consumed by various flocks during the seasons of 1915-16:

BARRED ROCK PULLETS

	No. of Birds	Grain consumed per bird							
		Wheat	Wheat and Corn	Crushed Oats	Bran	Bone Meal	Milk	Grit & Shell	Eggs Laid
May hatched.	100	30.15	10.38	40.66	.....	.....	65.08	1.89	130.5
April "	160	30.88	18.10	21.02	2.19	1.03	98.09	3.09	152.1
March "	160	32.15	20.9	24.78	2.9	1.2	98.29	3.54	165.
Average.....		31.06	16.46	28.82	1.696		87.153	2.84	149.2

A study of profitable egg production is interesting, and below is given the average wholesale selling price of good eggs in Toronto, less two cents per dozen, which is deducted to cover carrying charges, breakages, etc. In figuring the value

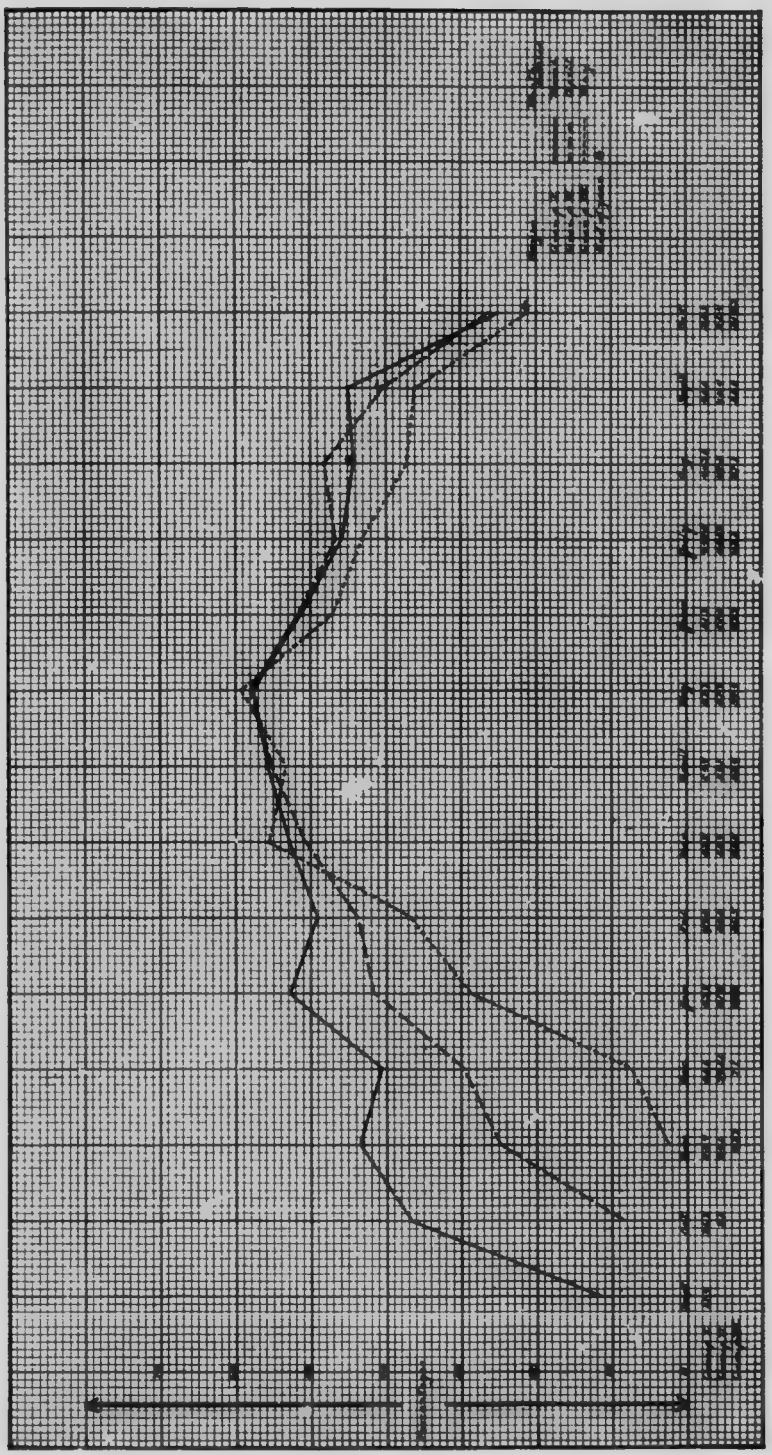


Fig. 5.—Percentage egg production by months of three groups of Barred Rock pullets hatched during the months of March, April and May.

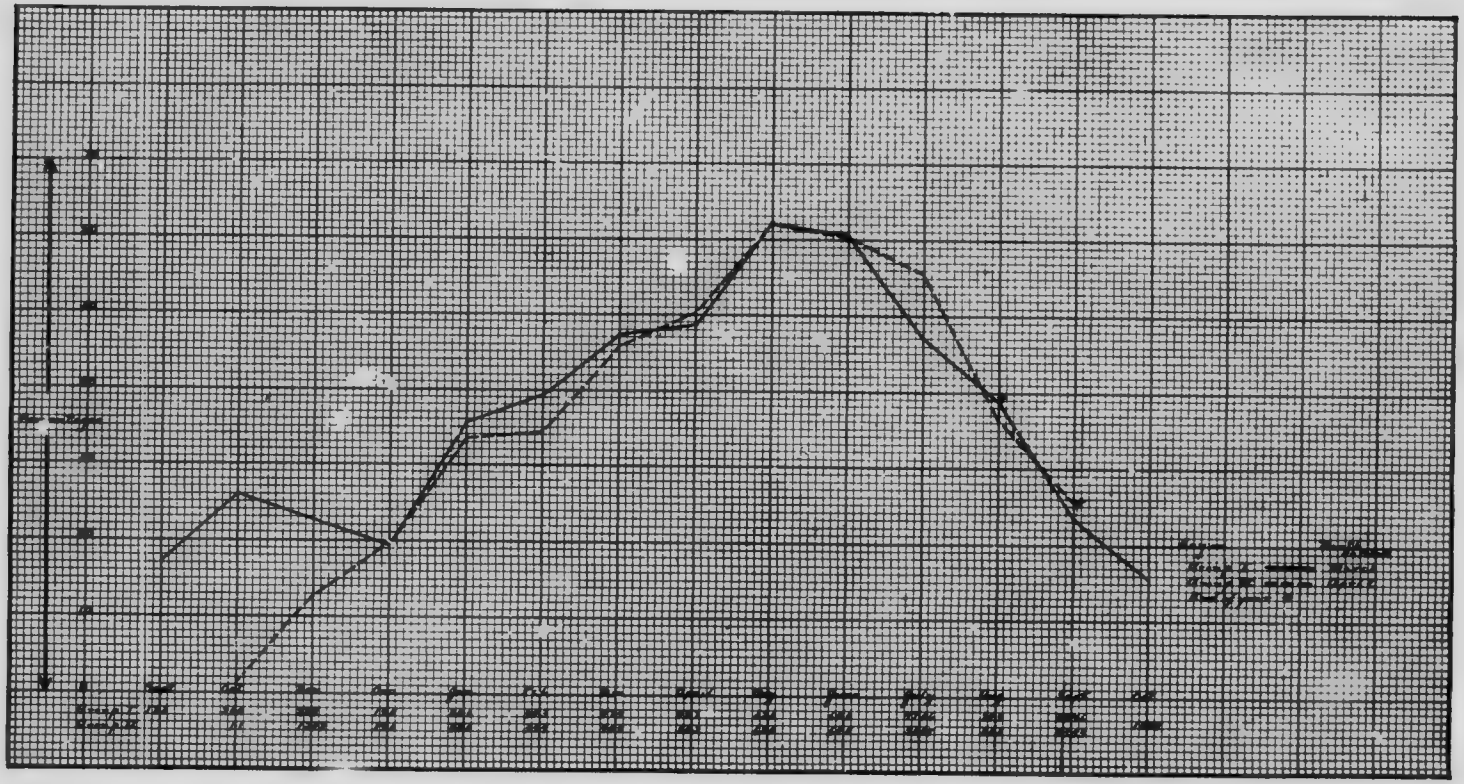


Fig. 6.—Percentage egg production by months of two groups of White Leghorn pullets hatched during the months of March and April.

of eggs produced from pullets we deduct five cents per dozen for eggs produced during September and October, owing to the pullets' eggs at this season being small; in other words, we try to give the buyer one and one-half pounds of eggs for the market price of one dozen eggs.

September, 1915	25	cents	April, 1916	20.5	cents
October, 1915	32	"	May, 1916	22.75	"
November, 1915	43	"	June, 1916	24.5	"
December, 1915	50	"	July, 1916	27	"
January, 1916	36	"	August, 1916	28.75	"
February, 1916	25	"	September, 1916	33.5	"
March, 1916	23	"	October, 1916	38	"

A glance will show that the value of eggs produced will depend much upon the months in which they were laid. This naturally leads to a study of the number of eggs laid by various pens. We do not purpose to answer all questions, but we are presenting the percentage egg yields by months of Barred Rock pullets hatched in March, April and May; also White Leghorn pullets' egg yields by months hatched in March and April. These figures should not be interpreted as possibilities of the two breeds, as the strain or selection work might show as great a difference between strains of the same breed. This much, however, appears yearly as a breed character—that Leghorns lay better in the warm weather, and are much more inclined to decrease rapidly in zero weather. "Why?" is another question. The size of the bird may be a consideration, and the writers would suggest to Leghorn breeders a trial on limited number of birds increasing the weight from one-half pound to one pound heavier than that given in the standard.

The March-hatched birds in both varieties were put into laying quarters on September 1st, or at an age between five and six months; the April pullets were put into the laying pens on October 1st and the May pullets on November 1st. The breeding was very much the same, so that variations due to individuals' sires and dams, while not entirely eliminated, could not be considered very seriously.

Individual matings show that with us May pullets are slower to mature than March or April hatched pullets. No doubt when small flocks receive special care and attention a much better showing would be made by May-hatched chickens. In round numbers we rear one thousand birds in each month, using three separate fields, hence the late birds are not injured by mixing with the earlier ones.

The Barred Rock chart means that the March-hatched pullets produced in twelve consecutive months four dollars' worth of eggs, the April-hatched pullets three dollars and sixty-three cents' worth of eggs, and the May-hatched pullets two dollars and ninety-one cents' worth of eggs.

The Leghorn chart means that the March pullets produced three dollars and twenty cents' worth in eggs, and the April pullets three dollars and six cents in eggs. The total eggs laid by both Leghorn groups is practically the same; the difference in value is due to the season the eggs were laid and the wholesale price of eggs.

These figures are given in the hope that they may suggest, particularly to the specialized poultryman, the necessity of carefully recording his daily, weekly, or monthly records of producing costs and profits. The keeping of poultry as a specialized business means if success is to be obtained a daily or at least weekly record of the loss and profit statement. Success or failure depends much upon these accounts. Yearly statements usually show losses, leaks, etc., too late.

MEAT PRODUCTION.

Most poultry in the end finds its way to market. When one considers that every other chicken reared is a cockerel, and that at least ninety per cent. of these are sold as market poultry, the importance of this branch of the business requires attention.

There can be no doubt that the selling of thin or unfinished chickens is a national waste; and, moreover, when one considers that our large packing houses find it profitable to fatten these thin chickens, there is left no reason why the producer should not do so. The packer buys the feed from the dealer, pays rent for the building, which is frequently located in the city, where rent is high, employs some high-priced labor, and adds to these the overhead expenses; there is but one conclusion, and this is that money is not lost in finishing and fattening chickens.

Feed does much, but the breeding does more. The appearance of the breast or the development of the breast muscles depends more on breeding than on feeding. Hence select sires with long, well-muscled keels or breast bones; not too deep. This is easily done if you will take a few birds and handle them alive, and decide which ones are the best for killing, then dress them, and you will soon be able to select live birds with a considerable degree of accuracy.

A plump, well-muscled chicken always dresses to good appearance. Bare-breasted, crooked-keeled, and thin-legged chickens, no matter how fat, are hard to sell as compared to the well-muscled birds. Every time one breeds an inferior bird just so sure are you that you may expect a percentage of the offspring to be undesirable.

There are so many male birds from which to make a selection that one is surprised to find many bare-breasted males in use.

We cannot urge too strongly the use of pure-bred, strong, vigorous males with good breast development. Even with Leghorns, when the cockerels can only be sold at profit as broilers, the above is in a degree as true as with the larger breeds.

In these days of a shortage of meat the world over, one cannot pass by the question of meat production in poultry.

Figs. Nos. 7, 8, 9, 10, 11 are photos of hens that laid two hundred eggs or better in their pullet year; and Figs. Nos. 12, 13, 14, 15, 16, 17, 18 sons of such hens.

There will be noticed a great difference in shape or type, also that many of them stand somewhat upright and carry rather high tails. Scarcely any of them are what would be called symmetrical.

We have found them to be well muscled on the breast, economical feeders, and hardy. The value of the bird for food is measured by the amount and position of the flesh, not by the arrangement of the feathers and the general outline of the bird. To judge their value one must get below the feathers.

CONSTRUCTION OF POULTRY HOUSES.

The poultry house or pen is essentially an important factor in determining success or failure in the poultry business. Type of house is not so important, as we find poultry thriving and yielding good returns from houses which are distinctly different in type. It is, therefore, very difficult to lay down any hard and fast rules relative to type. The tendency at the present time is towards cheaper houses, with better ventilation. The hot-house style of housing poultry during the winter

Fig. 7.—A 200 egg hen.

Fig. 8.—A 200 egg hen.
Note the difference in type between 7, 8, 9, 10 and 11.

Fig. 9.—A 200 egg hen.

Fig. 10.—A 200 egg hen.

Fig. 11.—A 200 egg hen.

Fig. 12.—A son of a 200 egg hen. Note the difference in type of 12, 13, 14, 15, 16, 17 and 18.

Fig. 13.—A son of a 200 egg hen. Note the high tail nad upright carriage of the body.

Fig. 14.—A son of a 200 egg hen. Note the low carriage of the tail.

Fig. 15.—A son of a 200 egg hen. Note the very br ght eyes and high carriage of tail; also flat breast. Witbal this bird was extra well feathed.

Fig. 16.—A son of a 200 egg hen. One of the very nervous types.

Fig. 17.—A son of a 200 egg hen. A slow developing bird, but very full in the breast.

Fig. 18.—A son of a 200 egg hen. One of the real good ones as a combination of meat and eggs. Note the length and width of body and the good vigor.

has not been satisfactory, many houses being damp and the air in them anything but fresh and agreeable. Disease has been quite common, and results in many cases have been disappointing.

Every poultry house should be well ventilated. It should be dry and free from draughts. The sun's rays are very beneficial to fowls, especially during the winter months, hence the house should be well lighted; at least one-third of the south or west side should be of glass or otherwise opened to the sun. It is preferable to have it face the south or south-east. It is best to have the house located in a sheltered

Fig. 19.—Backyard poultry house, suitable for city, town, or village.

situation when possible, as fowls do not like strong winds. As dryness in and about the house is very essential to success, it is advisable to select a location that is naturally well drained.

BILL OF MATERIAL.

20 pieces 2 in. x 4 in. x 12 ft. rough hemlock—studs, rafters, girts.
4 pieces 2 in. x 4 in. x 10 ft. rough hemlock—plates and sills.
4 pieces 2 in. x 4 in. x 16 ft. rough hemlock—collar ties.
180 feet 1 in. rough hemlock—roof boards and strip on collar ties.
1 1-3 sq. shingles or prepared roofing.
230 feet face measure ⅞ matched sheeting for outside walls, pine.
27 feet ⅞ in. matched flooring, 8 ft. or 16 ft. lengths, pine; drop board.
3 pieces, ⅞ in. x 6 in. x 12 ft. pine, dressed two sides, cornice.
100 feet run ⅞ x 2½ pine, dressed two sides, casings, etc.
60 feet ⅞ in. hemlock, sheeting for inside; for north end.
2 pieces, 2 in. x 3 in. x 10 ft. pine, roosts.
1 sash, 2 ft. 11 in. x 3 ft. 6 in. x 1¾ in.—9 lots 10 in. x 12 in.
2 sash, 2 ft. x 2 ft. x 1⅜ in.—4 lots 10 in. x 10 in.

Cost of lumber without floor, $28.00.

Bill of Material for Wood Floor.

80 feet face 1 in. matched flooring, pine.
6 pieces, 2 in. x 4 in. x 8 ft. hemlock joist.
2 pieces, 4 in. x 4 in. x 12 ft. runners.

Cost—$5.00.

Cost of cement floor and foundation, $15.00.

College Poultry Houses.

For a number of years we have been trying various styles of houses. The first houses constructed were well built, tight and warm. They were fitted with stoves or hot-water pipes, so that the fowls could be kept at a comfortable temperature. This plan was not satisfactory, mainly for the reason that it was difficult to keep the fowls in good health, and furthermore, the eggs were low in hatching power. The cost of heating was also considerable; in fact, the entire equipment was too expensive to be successful as a business.

It was noticed yearly that the surplus stock held in the cheap houses was much healthier than those fowls kept in warm houses. During the past eight years we have been trying to evolve a house that could be cheaply constructed, that would keep the fowls in good health, and at the same time get a fair egg yield from the fowls so housed.

Several years ago, four houses, representing different styles of popular poultry houses, were constructed. These houses were stocked with birds representing, as nearly as possible, the same strains of the breed. The breeds used were White

No. 4. No. 3. No. 2. No. 1.

Wyandottes and Buff Orpingtons, the one a rose-combed breed, the other a single-combed breed.

The houses are of equal size as regards floor space. Each house is 24 feet long and 12 feet wide. The house is divided by a wire and board partition, making two pens, each 12 feet square. The pens will accommodate from 20 to 25 birds each, or about 50 to the house. Fig. 20 shows fairly well the appearance as regards windows, etc., of the house. The roosting quarters of each house are very similar in construction. A dropping-board is used, which is constructed of matched dressed lumber. The board is placed at the back of the building, and is about three feet above the floor level. The dropping-board is three feet wide. The roosts are made of dressed 3 x 3 scantling, and are placed six inches above the dropping-board.

House No. 1 is made of matched boards, which are dressed on one side. The front and ends of the house are single-ply. The back is sheeted on the inside, building paper being used under the boards so as to make the wall tight or free from draughts. The windows in the house slide back and forth, so that the ventilation can be adjusted to the weather conditions.

Trap-nests are used in all the houses, and are placed at the ends of roosts in section marked "Cock Pen, Fig. 21." In this way the entire floor space of the pen is left for the birds as a scratching pen.

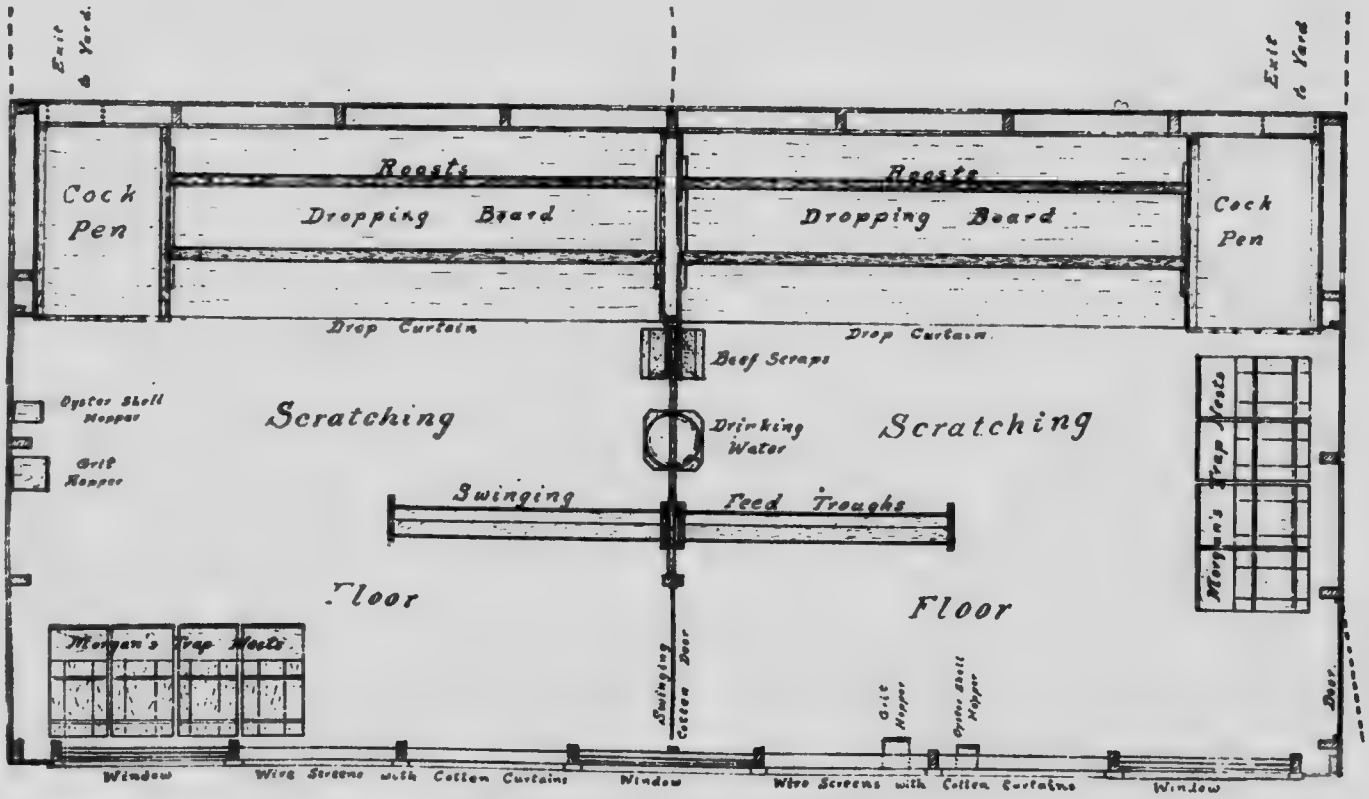


Fig. 21.—Ground Plan of House No. 2.

The general arrangement in the other Houses is much the same.

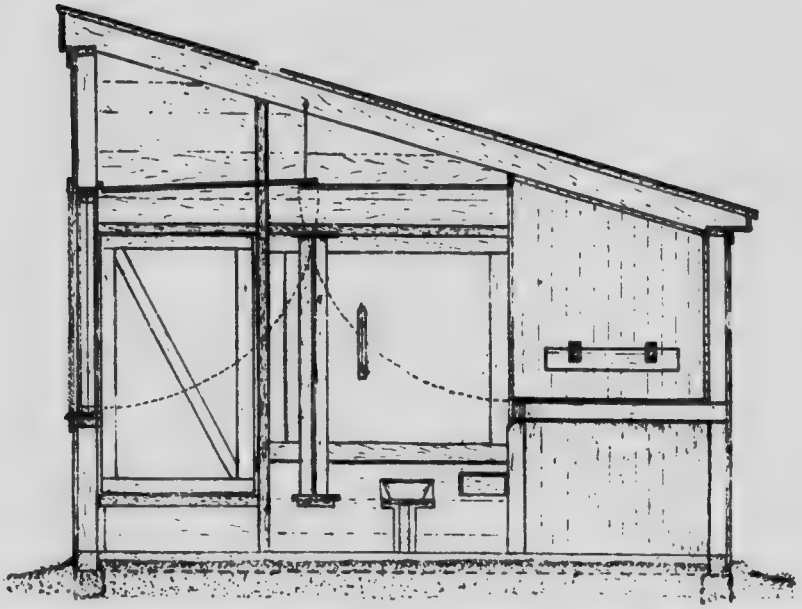


Fig. 22.—Cross section of House No. 2, showing the curtains in position for the day, etc.

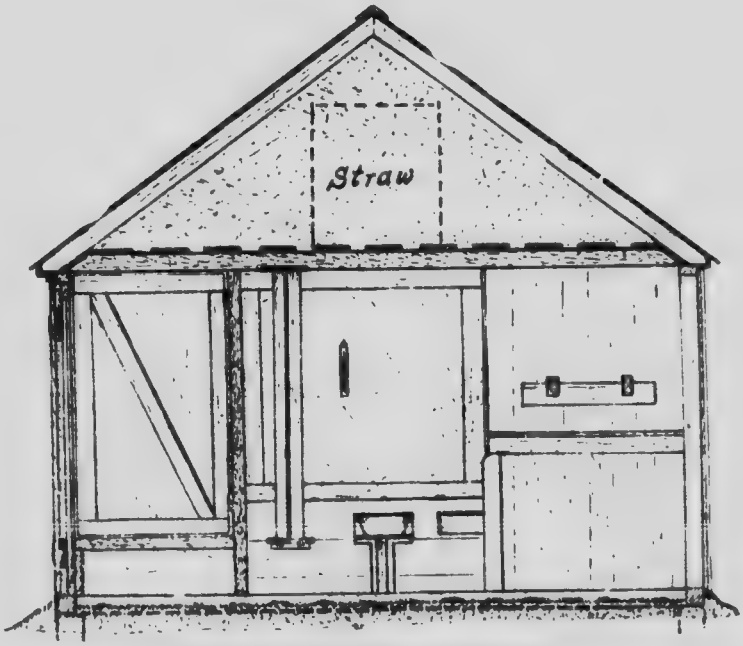


Fig. 23.—Cross section of House No. 4.

The second house is what is known as the "Maine State" house. This house is practically open to the weather on the front or south side. There are canvas curtains, which can be dropped as a protection against wind and snow on stormy days. On other days these canvas curtains are to be rolled up, and the fowls allowed to exercise in the fresh air. The ends of the house are single-ply matched lumber; the back wall of the house is matched lumber lined with paper, and is sheeted again on the inside. This is done in order to make a warm roosting coop.

The third house is the warmest house of the four, and is built of matched lumber and lined with paper. There is a dead-air space between the inside and outside walls. The building is made as tight as possible, the windows, doors, etc., all being made to fit tightly.

Many houses built on this plan are moist inside. To do away with the moisture we have a straw loft. The straw is placed on boards, which are from four to six inches apart. These boards are placed on a level with the roof or ceiling. The straw absorbs the moisture and keeps the house dry.

The fourth house is one of the extremely airy ones, being made of boards that are dressed on one side and the cracks battened; about half of the front is open to the weather, but may be closed on stormy days by large doors. There is not any special protection for the roost, the chickens roosting in this house in exactly the same temperature as they worked in during the day. This house, needless to mention, is much cheaper than the other styles.

The following record shows in a concise form the difference in the percentage of egg production in favor of the cold or fresh air house during the five years for the months of December, January, February and March; the first year being December, 1904-05, 76 per cent.; 1906, 8 per cent.; 1907, 11.8 per cent.; 1908, 15.6 per cent.; 1909, 12.4 per cent.

The house with the cloth front and the one with the movable windows compare favorably with the cold house. There is probably not enough difference in the actual egg production to warrant a statement that either of these houses is very much inferior to the cold house. They are about three degrees warmer than the coldest house and about fifteen degrees colder than the warm house.

These figures must not be taken to mean that hens will lay better in a cold house than in a warm one, but that fresh air is essential to health, and health is a factor in egg production. When one tries to retain the animal heat of the body to maintain the heat of the house, one necessarily allows but little air circulation, hence the air becomes foul or stagnant, which is not healthful.

The above results indicate that the free admission of fresh air is a very essential factor in house construction.

House No. 3 in Fig. 20, which gave the poorest results for each of the five consecutive winters, was operated quite successfully the sixth and seventh winters by introducing more fresh air, that is to say one-half of the windows were removed until about December 1st, and when these were put in, the openings (about one foot square), where the fowls go out into the yard at the north side, were left entirely open. These, except during mild days, appear to supply sufficient air to keep the birds doing nicely. This statement is made as a means of helping any person who may have a similar house, and who wished to continue using the same.

Our experience is that all four houses, while fairly satisfactory, especially No. 4, are not all that may be desired, for the reason that they must be adjusted according to weather conditions—that is to say, on bright, sunshiny days, the doors, movable windows, or cloth screens should be opened for nearly all the day; or, again, for but an hour, depending upon the sunshine and temperature.

Fig. 24.

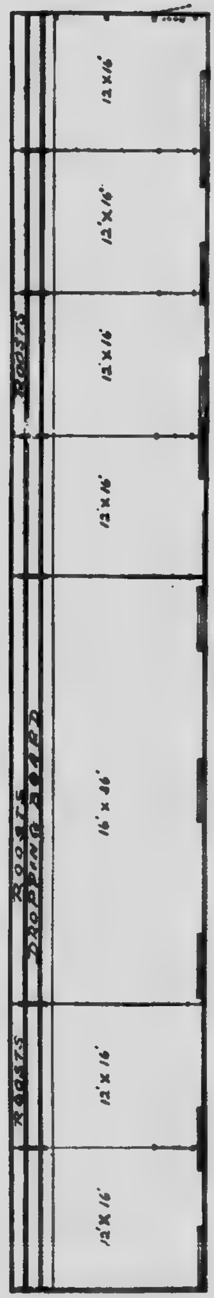

ROOSTS
ROOSTS
DROPPING BOARD
ROOSTS
12'x16'
12'x16'
12'x16'
12'x16'
12'x16'
12'x16'

Fig. 25.

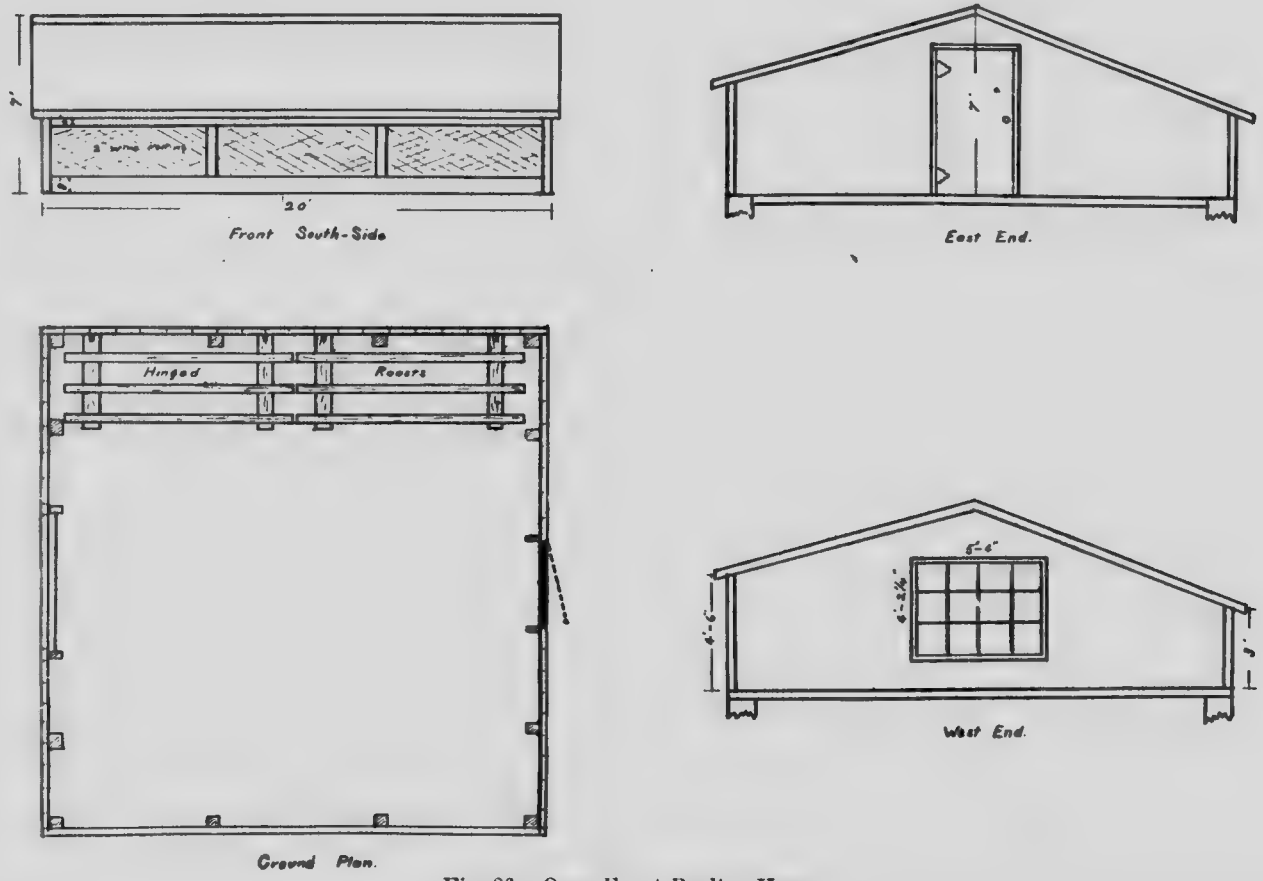


Fig. 26.—Open Front Poultry House.

The slope or shanty roofs on houses Nos. 1 and 2 have not been as satisfactory as the pitched roofs on houses Nos. 3 and 4. The roofs on the latter houses are more durable and the houses themselves much cooler in summer, and furthermore, the straw lofts in these houses are very effectual in preventing dampness in the houses; no frost collects upon the walls or ceilings.

We have tried several houses with curtain fronts, and we are pleased to say they work fairly well when used in a house as in Fig. 24, which is practically the same style of house as No. 4 in Fig. 20, but these require adjusting according to the weather, and if they are not kept brushed, the dust and dirt will gather to such an extent as to prevent free ventilation, so that they will not ventilate very well. Our experience has been that such cloth screens should be of the cheapest cotton; heavy cotton or duck scarcely ventilates at all. There is yet another objection to these cloth screens, in that the hens, especially the lighter breeds, become notionate about trying to lay or roost upon the screens.

To the person who is breeding the tender varieties, or those with large combs, some means must be taken to keep them fairly warm, or their combs will become

Fig. 27—Open front poultry house.

badly frosted. The females of such breeds as Leghorns or Minorcas will stand a temperature considerably below zero without frosting their combs.

The question naturally arises—can a house be constructed which is nearly self-operating, that will keep the birds in health, and at the same time ensure a fair egg yield?

Our experience has been that the fowls thrive best in low-down houses especially during the winter. We have four houses with the fronts entirely removed, except a two-foot wire netting, which keeps the fowls in, and the sparrows, etc., out. These houses, for this climate, must be low down, especially in front, to keep out the snow and a portion of the wind. It is the writers' opinion that Figs. 26-27 will meet the needs of the average farmer, where he wishes to keep from seventy-five to one hundred hens. The house looks too cold, but the birds do well. They possibly could be made to lay eggs during the months of January and February with cotton screens properly adjusted to meet the weather conditions; but few farmers

would be there at the exact time to do the adjusting, hence we use it entirely open.

The large window in the west, essential for light, should be hinged at the top so that it may be opened during the summer months, otherwise the house will become too warm in summer.

Bill of Material for 20 x 20 House.

6 pieces 2 in. x 4 in. x 14 ft. hemlock sills; if set on post use 4 in. x 4 in.
12 pieces 2 in. x 4 in. x 14 ft. for studding, girts, plates, etc.
24 pieces 2 in. x 6 in. x 12 ft. for rafters and ridge tree.
600 feet of matched hemlock for roof and drop board.
5 square roofing.
250 feet 1 ft. x 10 in., dressed one side, for boarding ends and back.
7 pieces 1 in. x 4 in. x 14 ft., pine, dressed one side, cornice.
8 pieces 1 in. x 8 in. x 14 ft., pine, dressed one side, cornice.
25 lbs. nails—5 lbs. 4 in. nails; 3 lbs. 2 in. nails.

It will be noticed that no dropping-boards are used in this building. During the winter the manure freezes almost as soon as it is made, hence no odor or bad results, and if cleaned, say every two months, it will answer very well. We would rather have this condition than dropping-boards covered one foot deep with manure, as we frequently see them.

A number of houses of this style are in operation in various parts of the province, and they are giving fair results. In some of the colder sections, such as in the district north of Barrie, the house appears to be too open for severe winter weather. In such cases we would suggest using movable cotton screens on two sections of the front. The illustration shows three sections, one of which should always be open. During the winter months the centre screen may be closed nearly all the time and the end screen moved to either side, depending on the direction from which the wind is blowing. We have seen similar houses, two-thirds of the front of which were covered with a cotton frame, which could be thrown on the roof during bright, warm days and let down over the front during the cold nights and stormy days.

In a few cases, open front houses have been built only twelve or fifteen feet deep and twenty or more feet across the front. This is not advisable, owing to the fact that should there be a direct wind blowing into the house the birds cannot get back far enough to be out of the draught. This house is built to accommodate not less than one hundred birds, and will work well with as many as one hundred and twenty-five during winter weather. If a smaller house than the twenty by twenty is desired it should be built, say, twenty feet deep and ten feet wide rather than ten feet deep and twenty wide. The width across the front should never exceed the depth.

Snow will occasionally blow into the house, but we have had very little trouble in this respect. Having the building deep, low, and narrow tends to prevent this. A rather small opening in front will not allow the wind and snow to blow far back into the house, and the depth allows the birds to keep out of the wind. If there is continuous rainy or damp weather for several days the litter will become damp and must be removed at once. Both walls and floor must be kept dry or the birds are likely to suffer from disease of some kind. There should be no opening except that in the front, or there is likely to be a draught through the house, and this should be avoided.

The following is the egg production for 100 April-hatched White Leghorn pullets from November, 1912, to June, 1913 (inclusive). These pullets were housed in an open front house (see Figs. 26 and 27).

				Total Egg Production.
Pullets	laying in	November	— 71	795
"	" "	December	— 68	889
"	" "	January	— 65	753
"	" "	February	— 74	554
"	" "	March	— 92	1,765
"	" "	April	— 99	2,023
"	" "	May	— 94	1,863
"	" "	June	— 91	1,688

NOTE.—The winter of 1912-13 will be remembered as exceptionally mild. We have seen the temperature as low as nine degrees below zero inside the house during other winters. Some males' combs will freeze at such temperatures, and, moreover, the egg production is slightly affected for a few days.

In conclusion, we are free to admit that the open front house apparently keeps the stock in better health, brighter in plumage, and it requires less labor

Fig. 28.—House suitable for converting into a 20 ft. x 20 ft., or 20 ft. x 24 ft. House 4, Fig. 20.

than any house we have yet used. It is not perfect, and no doubt could be improved upon for special painstaking poultrymen, but this class is very limited, and the house as now used comes most near to meeting the average man's position.

Those who would prefer something different in type from the foregoing might find it in Fig. 28, by changing the dimensions. The house as shown in cut is 12 ft. x 24 ft. This could be changed to 20 ft. x 20 ft., or 20 ft. across the front and 24 ft. deep from front to back. In altering the house to accommodate it to the above dimensions the door is removed from the near end and the double doors from the front. The centre windows are moved to the place occupied by the double doors, one to each set of doors, and also move the two windows near the ends in to meet those moved from the centre. Then place a single door in the centre of the front. Secure an old window shutter, and place this in the upper half of the door to provide ventilation for the pen. It would also be advisable to place a window of the same size or larger than those in front in the west end of the house and another in the east end. These would increase the amount

of light admitted to the pen, and if hinged at the top, could be hooked up to collar joist in summer, thereby getting more circulation of air through the pen in the hot weather and keep the pen cooler.

Long, Continuous House.

No doubt some readers will wish for a plan of a long, continuous house, in which a large number of fowls may be housed under one roof, or where a number of different breeds can be kept in the same building.

Fig. 25 gives the ground plan of this building as now used. The partitions are temporary, made of cloth tacked to wooden frames, and can be moved or adjusted to suit almost any sized flock. This house was originally used for flocks of 50, 75, and 100 laying hens, with the idea of testing large and small flocks. The house was used in this manner for three seasons, with slightly better results from the flock of 50.

The plan as now given accommodates 25 fowls in each flock, with the exception of the large pen, in which can be kept 75 fowls of such breeds as Rocks or Orpingtons, or 90 of such as Leghorns. The large pen could, of course, be divided into the smaller pens.

For the purpose of carrying on more extensive breeding work, a long, continuous house was built in the fall of 1912. This building is 208 ft. long, 12 ft. wide, 8 ft. high in front, and 5 ft. high at the back. The house is single boarded with inch lumber; the cracks battened. It rests on a concrete foundation 8 in. wide at the bottom and 6 in. at the top; the floor also be of concrete 3 in. in thickness. Below the floor is at least 8 in. of small stones, on which was placed enough gravel to allow the laying of the floor. Our experience is that it requires at least 8 in. of filling, such as small stones, etc., beneath the concrete. The studs are 2 in. x 4 in. placed 3 ft. 6 in. apart, and the rafters 2 in. x 6 in. each placed 2 ft. apart.

For breeding work it is often advisable to mate small pens. This house is divided into thirty-two pens, each 6 ft. 6 in. wide, each pen accommodating about eight or ten birds. A dropping-board three feet from the floor is used. There are two roosts, four feet long, to each pen.

A portion of each partition is made movable, so that larger pens may be had should they be required. Four and one-half feet from the back they are of matched lumber and stationary, the balance being of two wooden frames covered with nine-ounce duck. These may be removed at any time, and a number of pens allowed to run together. If this is done, the solid portion of the partition at the back materially assists in checking draughts, which are common in long, narrow pens.

In the front of each pen is a door, and also a window consisting of sixteen lights, 8 in. x 10 in., as shown in Fig. 29. The upper part of the door is of wire netting covered with a movable frame in extremely cold or stormy weather. This style of house should prove useful to poultry breeders. During the winter of 1912-13 the cotton frames were not used the greater part of the time, and we had little or no trouble with frozen combs.

General Rules for Building.

It is necessary to allow from four to six square feet of floor space per bird; the amount actually required depending upon the size of pen and the type of construction. The larger and more open the pen, the less floor space required per bird. Roosting requirements differ with the different breeds. Brahmas, Cochins, and

such other heavy breeds require ten inches of perch room per bird; Plymouth Rocks, Wyandottes, Reds, etc., require about nine inches; and Leghorns, etc., about eight inches. All perches should be placed on the level, as in Figs. 29 and 33. Perches where built ladder style will cause birds to crowd for the top perch, thereby causing trouble. Roosts should be made low or near the floor. There are several reasons for this. Birds of the heavy breeds cannot fly high up, and any bird is liable to injure the soles of the feet in jumping down from high perches.

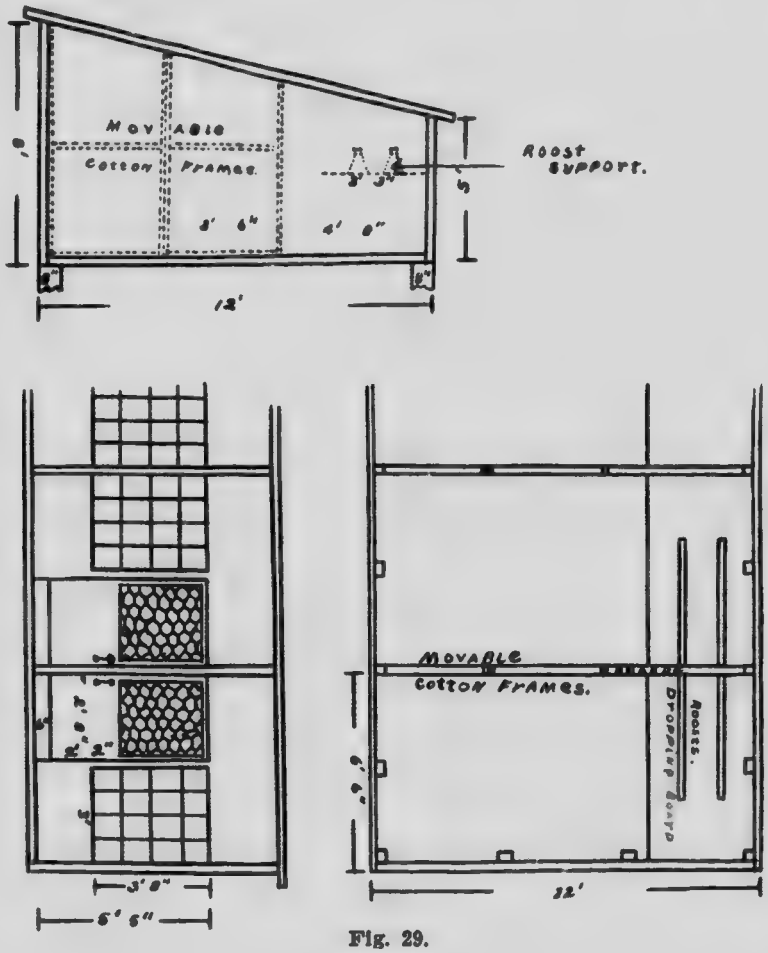


Fig. 29.

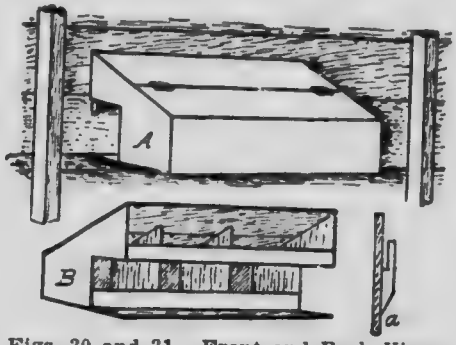
When dropping-boards are used they should be moderately low down to admit of easy cleaning. Dropping-boards should be made of matched lumber, and should be twenty inches wide for one roost and three feet wide for two, the first perch being placed ten inches from the wall and the others at fourteen inch centres.

Roosts 2 in. by 2 in. or 2 in. by 3 in. are preferred, the upper edges to be slightly rounded.

Cement floors are most sanitary, and are easily kept clean. The first cost is possibly high, but their durability commends them to general use. Ground floors are more in favor than wood and cost less. The greatest objection to the ground floor is the excessive amount of dust in the pen therefrom.

Cement floors for best results should be raised so that the surface of the floor is at least eight inches above the level of the ground. The intervening space is filled with cobble stones or coal cinders. A three-inch cement floor will be found heavy enough for the henhouse; two and one-quarter inches of filling and three-quarters of an inch of finish.

NESTS. These should be provided at the rate of one nest to every four or five hens in the pen. All types and sizes of nests are used, but with open nests



Figs. 30 and 31.—Front and Back Views of Nests. (*Poultry Craft.*)

placed on the floor trouble may be experienced with the hens eating their eggs. This is overcome by providing nests which are partially darkened, as in the case of Figs. 30 and 31. Raising nests off the floor permits the use of the entire floor space for scratching purposes. All nests should be from twelve to fourteen inches square and not over six inches deep.

TRAP-NESTS. This is a necessary evil where pedigree breeding is to be conducted. Whether it would be advisable for a man to trap-nest his stock will depend

Fig 32.—Trap Nest.

Fig. 33.—Trap Nest arranged above the roosts.

upon his object, and the time and expense he is willing to incur in attaining the same. The price of trap-nests vary from eighty cents to one dollar and eighty cents each. The cost of operating the same would be approximately fifty cents per bird per year, which would include the necessary record keeping. Where trap-

nests are used they must be visited at one and one-half to two-hour intervals during the day. This is especially important during the hot summer weather, as otherwise birds are liable to die, due to suffocation.

Trap-nests are for the most part patented. The nest which we have used for a number of years, and which we believe is as efficient as any on the market,

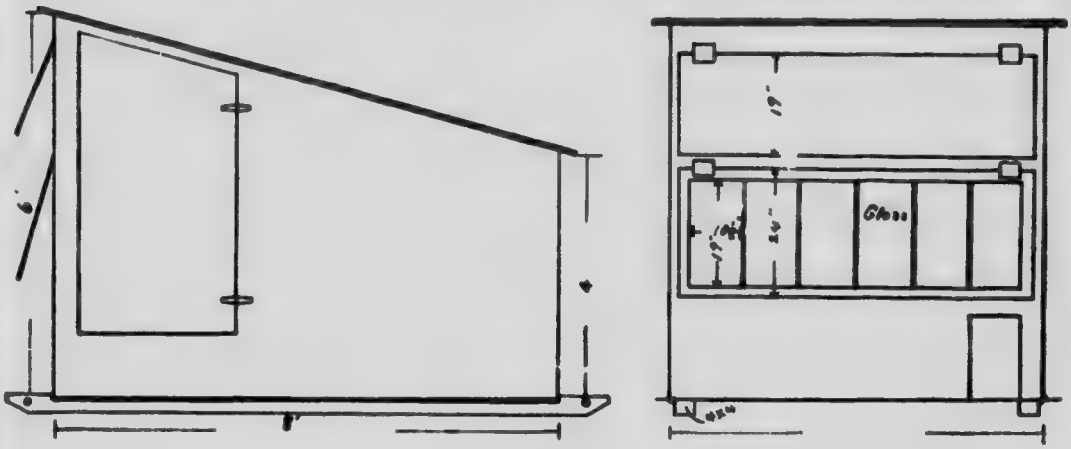


Fig. 34

is the one shown in Figs. 32 and 33. This nest represents in a general way the type of all trap-nests. It is made up of two compartments, with a trap or door on the front end, which closes automatically with the bird's entrance into the nest, keeping the bird captive until released by the attendant.

The nest is constructed of three-eighths inch material, 24 in. long, 12 in. wide, and 13 in. high. A four-inch board is placed across the bottom of the nest

Fig. 35.—Colony House in Fig. 34.

twelve inches from the front, which divides the lower part of the nest into two compartments, the back one containing the nesting material and the front the trap. The trap is eight inches from A to B, and seven and three-quarter inches from A to C. The trap is so adjusted in its attachment in nest that when it is tilted back into nest, resting within three inches of top of centre partition, it is just overbalanced.

The back of the bird coming in contact with it as she steps over centre partition raises the trap sufficiently to tilt it forward, thus closing the trap.

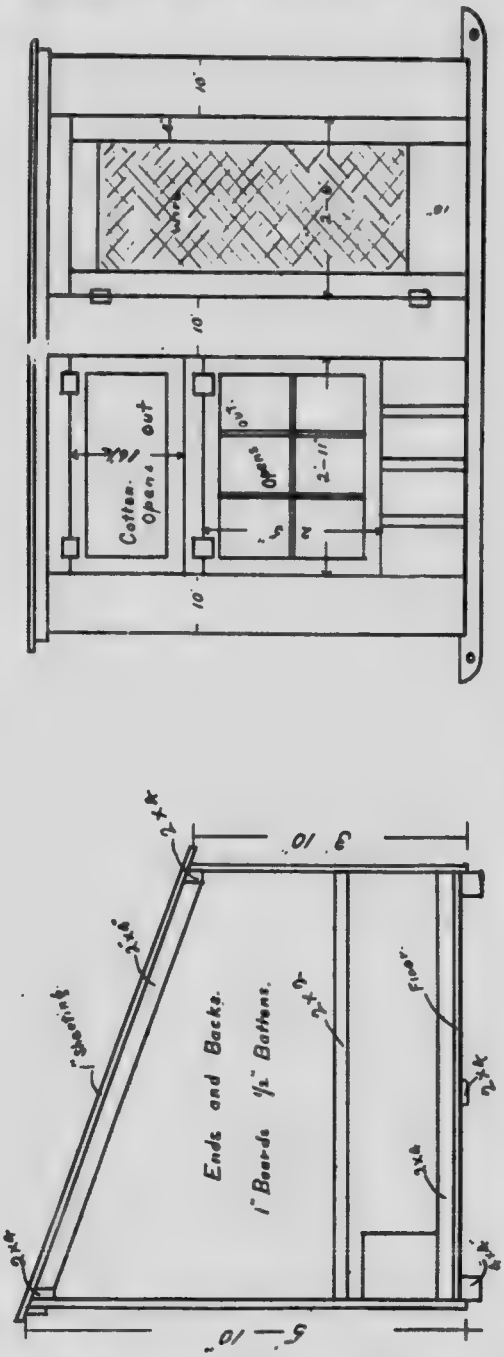


Fig. 36.—Bill of Material for Colony House.

Drinking utensils of some form or other are necessary, and the more simple in construction the better. The writers have found open pens as efficient as any, the size depending on the size of the flock to be accommodated. They should be

made of some material which is smooth and as free from seams as possible, to facilitate cleaning, as frequent cleaning of drinking utensils is necessary to prevent them from becoming slimy. In large flocks we have used steel hog troughs, holding from twenty to thirty quarts, with good results.

In our experience the largest egg yields are obtained from flocks containing twenty to thirty birds. Some succeed with sixty to seventy-five in a flock, but they are in the minority. Considering, however, the cost of housing, labor, etc., the most economical returns will be secured from flocks of about one hundred birds.

Colony Houses.

There is a constant demand from people living in towns and cities for plans of houses suitable for housing six to twelve hens. In some instances they wish these houses so constructed that they can be moved easily from place to place.

Fig. 37.—Colony House in Fig. 36.

The man who is using artificial means of brooding and raises over one hundred chicks, is finding the portable colony house a valuable adjunct to his equipment, as it enables him to place his young chicks on fresh ground every year.

The plans herewith submitted are adaptable to these conditions, and have been used by the writers for the purposes mentioned above. The houses are of sufficient size to accommodate one hundred chicks to a two-pound weight, or fifty chickens to four or five pounds; but for winter use we would not advise putting in more than a dozen laying hens. (See Figs. 34, 35, 36, and 37.)

Bill of Material for 6 ft. by 8 ft. Colony House.

2 pieces 4 in. x 4 in. x 10 ft., runners.
3 pieces 2 in. x 4 in. x 7 ft. 10 in., plates and centre runner.
2 pieces 2 in. x 4 in. x 5 ft. 10 in., end sills.
2 pieces 2 in. x 2 in. x 5 ft. 10 in., roost supports.
50 feet 1 inch matched flooring.
50 feet 1 inch roof boards.
100 feet run, ½ in. x 2 in. battens for ends and sides.
140 feet 1 in. x 10 in. outside boarding: door, etc.
½ square shingles.
1 sash, 6 lbs., 10 x 12 glass.
1 cotton screen, 2 ft. 11 in. x 16½ in.
1 door, 2 ft. 6 in. x 5 ft. 6 in.
1 cotton screen, fits on doors.

In Fig. 38 is shown a cut of a window adjusted for ventilation purposes. The window is 6 in. from the ceiling and 18 in. from the floor. It is hinged at the bottom and the opening at the top is adjusted with a cord. Burlap is placed along the sides of the open window. A low-grade open burlap should be used. This does not interfere with the light, is not attended with draughts, and gives good

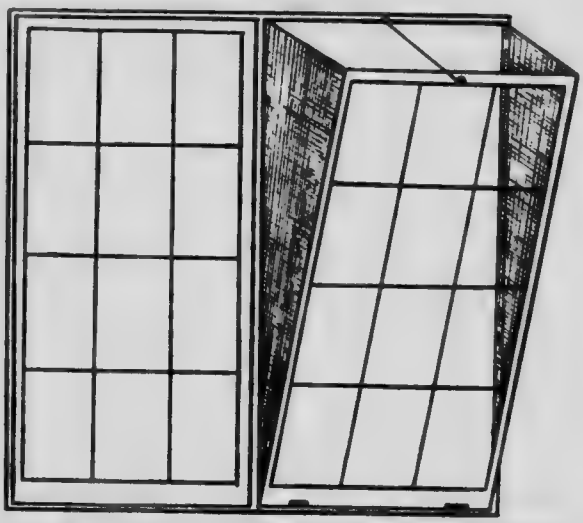


Fig. 38.—Window arranged for Ventilation Purposes.

ventilation. In presenting the above, it is done with the object of presenting a suggestion for the alteration of some house now in use which is not giving satisfaction, at present due to lack of ventilation, as indicated by frost on walls and ceiling. The alteration can be made at a very small cost, and might be preferred by some to curtains.

FEEDS AND FEEDING.

A fowl requires a variety of deeds. While it is true that the whole grains and the milling by-products from the same form the major portion of the bird's ration, it is absolutely essential that they receive also green feed, animal food, drink, grit, and shell-forming material. All these foods must be clean and wholesome, and furthermore, a portion of them should be given in some form so as to induce the birds to take exercise, so that the fowls will keep healthy. The drinking material, which should be given at regular and frequent intervals, may consist of water or milk. The supply must be clean, as dirty water, dirty or slimy drinking dishes, etc., will do more towards making a flock unhealthy and diseased than possibly anything else. Most attendants are inclined to forget to clean the drinking vessels and to keep them well filled at all times.

Grains.

The value of the different grains for feeding poultry varies both with the chemical composition and the physical properties of the same. For instance we find some grains which, considered from their chemical composition, are excellent

feeds, but due to the high percentage of fibre, etc., are not satisfactory for feeding in the whole state. Fibrous material is only very slightly digestible by fowl, owing to the structure and actions of the organs of digestion, hence their low feeding value.

Wheat is, without doubt, the most popular whole grain in use by poultry people of Ontario, and is one of the best. It is relished by all classes of poultry. The price of wheat as compared with that of other grains during the past few years, makes it necessary to mix other grains with it. It is very doubtful whether it is advisable at any time to feed only one kind of grain constantly, as a variety is better; some birds like one grain, while others relish another. Plump, soft wheat is usually more palatable for the birds than hard wheats, but the latter may have slightly higher feeding value.

Shrunken wheat, where caused by drouth or frost, has higher feeding value than plump grain, and as it is not suitable for milling purposes can often be economically used for feeding purposes.

Wheat screenings are the refuse from the better grades of wheat, and vary greatly in feeding value. Cleaned wheat screenings are now on the market, but their value for feeding is not yet established.

Wheat bran is used largely as an ingredient of a mash. It is not credited at present with having as high-feeding value as it was once generally thought to have. Its greatest value is in giving bulk to the ration, preventing impaction of crop and stomach, and aiding the digestive juices in their action on the food. Wheat bran is also more or less laxative.

Middlings and shorts vary greatly in composition, hence their feeding value varies. They are useful for making mash mixtures, particularly for fattening. They are good to check looseness of the bowels where an excess of vegetables is given.

Low-grade flour is often a cheap and economical food to use in mashes for stock birds or for fattening chickens. It is more or less constipating, resembling middlings and shorts in its action.

Corn is not used as extensively in Ontario as it is in the Central and Eastern States. In those parts it forms the major portion of the whole grain ration. Corn is more of a heating food, and while very satisfactory for feeding even in large quantities during cold weather, is likely to cause excessive broodiness, especially in the heavy breeds, if fed heavily during the warm weather. It is used whole, ground, and cracked, the meal being used principally in mash foods. Cracked corn is used for young chicks and fowls when scattered in the litter. Whole corn is too large and conspicuous, and when in the litter does not usually give sufficient exercise. In the opinion of the writers corn can be used in those sections of Ontario where it is grown extensively, much more freely than it has, heretofore, been.

Oats should be a first-class poultry food, but owing to the large percentage of hull, which in Ontario and Western Oats varies from twenty to forty per cent. of the whole grain, are not relished by the birds when fed whole, and for this reason are somewhat indigestible. When rolled, hull and all, they are an ideal food as a dry mash and are relished by fowls better than any other dry mash we have yet used.

Oat flour, oat middlings, or ground oats, are a by-product from the oatmeal mills. They do not contain any hull, and are extensively used for fattening chickens.

Barley is most valuable for feeding when finely ground and used as an ingredient in a fattening ration. It contains rather too much hull for feeding in

the whole state, and unless very well threshed so as to remove entire beard, it is not advisable to use without grinding.

Buckwheat is very popular as a whole grain in sections where it is extensively grown. It is sometimes difficult to get fowls to eat it at the first feeding. This is easily overcome in a few days if its feeding is continued and other foods withheld. After they once become accustomed to its appearance it is much relished by them. It somewhat resembles corn in its fattening properties, and, therefore, it is better for winter than for summer use.

Ground buckwheat, ground hull and all, is an excellent food to use in a fattening ration.

Rye and peas are not suitable for feeding extensively as whole grains, but may often be used economically if ground and used as ingredients in a mash for fattening purposes. Large quantities should not be used of either as they are each strongly stimulating.

Animal Foods for Fowls.

The most expensive foods given to fowls are the animal foods. These are used as a substitute for the worms and insects that form a portion of the natural summer food of fowls upon free range. Flocks confined to small runs require to be fed more or less animal foods during the winter, and during very long, dry spells in the summer; even where the range is unlimited it frequently pays to feed a little animal food.

Animal foods usually assist very materially in the production of eggs in winter. By some people these foods are considered as a forcing food, that is to say, they will induce heavy laying, which in some instances may be followed by serious sickness, or possibly the injury may be only very slight; in fact, unnoticeable, except that the eggs from birds so fed may be of very low hatching power.

It is generally believed, and we think rightly so, that good egg yields cannot annually be secured without the use of such foods as green cut bone, beef scrap, or cooked refuse meat, etc. Many believe that the larger the amount of these foods fed the greater will be the egg production. There is good ground for doubting this statement, in that these foods are expensive, and the extra eggs may cost more than they are worth. Moreover, here is where serious injury may be done to the hen's digestive and reproductive organs.

Milk is available on many farms, and it is claimed that as an egg producer this food is equal in value to any of the meat foods. Our experience has been that sour milk for fowls has a slightly greater value than sweet milk, and is certainly much more easily obtained.

A few years ago we planned an experiment, with the idea of studying what effect various animal foods would have upon egg production and the hatching power of eggs.

Below is given the results of the first three years' work, that of 1909-10 being carried on with Buff Orpington pullets, that of 1910-11 with Rhode Island Red hens and pullets, and 1911-12 with Leghorn pullets.

There were twenty-five females and two males in each pen, and all were housed in the same building. The grain and green food used were the same in each pen.

The animal foods are reckoned at the following prices:

Buttermilk, 20c. per 100 lbs.; Beef Scrap, $3 per 100 lbs.; Green Cut Bone, $3 per 100 lbs.

Experimental Feeding With Buff Orpingtons.

The following are the results for seven months, from October 1st, 1909, to April 30th, 1910:

Pen No.	Animal Food used	lbs. Whole Grain	lbs. Dry Mash	lbs. Animal Food	Total Cost	Total Eggs Laid	Cost Dozen Eggs	Percentage of Eggs hatch'd
1	Buttermilk.....	720	233	1,453	$18.16	2,040	10.68	55.0
2	10% dry mash beef scrap	840	337	34	19.85	1,670	14.28	50.5
3	Beef scrap in hopper...	900	216	141	22.21	1,664	15.84	33.0
4	No animal food.....	900	224	.....	17.99	1,496	15.48	59.5
5	Green cut bone.....	900	196	127¾	21.37	1,654	15.48	40.5

Experimental Feeding With R. I. Reds.

The following are the results of eight months, October 1st, 1910, to May 31st, 1911:

Pen No.	Animal Food used	lbs. Whole Grain	lbs. Dry Mash	lbs. Animal Food	Total Cost	Total Eggs Laid	Cost Dozen Eggs	Percentage of Eggs hatch'd
1	Buttermilk.....	973	535	1,765.5	25.60	1,762	17.43	57.0
2	10% dry mash beef scrap	898	535	61.5	23.06	1,320	20.96	56.4
3	Beef scrap in hopper....	907	510	106.0	23.92	1,625	17.66	51.66
4	No animal food.....	802	405	.....	17.70	730	29.09	66.25
5	Green cut bone.....	784	411	182.5	22.44	1,359	19.81	64.5

Experimental Feeding With White Leghorns.

The following are the results for seven months, October 1st, 1911, to April 30th, 1912:

Pen No.	Animal Food used	lbs. Whole Grain	lbs. Dry Mash	lbs. Animal Food	Total Cost	Total Eggs Laid	Cost Dozen Eggs	Percentage of Eggs hatch'd
1	Buttermilk.....	785	319	1,453	$19.46	1,508	15.5	68.2
2	Beef scrap in hopper...	750	205	81	16.76	1,158	17.3	69.2
3	No animal food.....	925	126	.....	15.77	602	13.4	74.2
4	Green cut bone.....	781	287	98	18.96	1,193	19.4	68.6

Comments on Above Tables.

With all three breeds, buttermilk produced the most and the cheapest eggs.

Where beef scrap was fed in a hopper or where the birds could eat all they desired, the Leghorns and Rhode Island Reds did much better than the Orpingtons.

No animal food in all instances gave the best eggs for hatching and the lowest egg yield.

From the results so far obtained it would appear to be a disastrous practice to undertake feeding Leghorns on no meat food ration, or meat food in very small quantities, for the reason that they developed feather eating to such an extent that some of the birds were killed and the males were a sorry sight; in fact, had to be frequently removed from the pen. This was true to a limited extent with the Rhode Island Reds, but was not so of the Orpingtons.

Green Foods.

When fowls have free range, they eat a considerable amount of grass, or other green foods. It would appear, therefore, to be desirable that where birds are confined, either in small runs during the summer, or in houses when the ground is covered with snow in the winter, some effort should be made to supply this food.

Many foods are available, such as waste cabbage, mangels, turnips, rape, clover hay or clover leaves, and green food grown especially for the purpose.

Early in the fall we use cabbage or rape; or at times where the runs have been sown to fall rye or wheat, the fowls are allowed to feed upon these. Where rape is extensively fed it frequently will cause the whites of the eggs to have a greenish cast, which renders them unmarketable. This food is relished by the fowls, but must be fed carefully. Cabbage at times will flavor the eggs slightly, and if frozen may cause serious digestive troubles. Both rape and cabbage make good green foods, but good judgment must be exercised in their use.

Mangels are a very succulent food, and are relished by the birds during the winter. They can be fed either pulped or whole. When they are fed whole, we usually stick them on a projecting nail, at a convenient height, upon the wall of the pen. When these are fed freely they frequently scour the fowls. For this reason during some seasons we are obliged to feed them not more than twice a week.

Turnips may flavor the eggs. They are not as palatable as mangels; in fact some birds will not eat them at all, but at the same time they have considerable food value.

Clover leaves, either steamed or dry, are relished very much, and upon the whole are a most reliable winter green food. One hundred hens will eat from a peck to a bushel of clover leaves daily. This food upon the farms is cheap and easily procured, and should be fed more than it is.

The growing of green food, *i.e.*, sprouted grains, is becoming quite popular with many, but we have never received sufficient results to warrant our growing it extensively, except for little chicks, although in some cases we have had good results from feeding to laying hens.

The ordinary plan is to soak the grain—oats are preferred—twenty-four hours in a pail or can. The ordinary greenhouse flat is useful for the purpose of sprouting, or any box three to four inches deep and one foot wide by two feet long. The bottom of the box should be perforated so as to provide drainage, otherwise the grain will rot. After soaking the grain for the time specified, spread in the boxes or flats, about two inches deep, and place boxes in a warm place, about seventy degrees or slightly higher, and where there is plenty of light. Sprinkle the grain regularly once a day until sprouted sufficiently to use. Most feeders allow the grain to grow two or three inches before feeding, which under ordinary conditions should take from ten to fourteen days.

Dry Feeding.

The tendency at the present time is to feed dry grain, and to use no wet mash foods. It has been claimed by some writers that mash foods, while tending to force growth, and possibly egg production, do not tend to produce good eggs for hatching purposes; that is to say, the mash is more or less of a forcing food. In the production of eggs, the number produced is probably as large, if not larger, where mashes are used, but the hatching power of the eggs in some instances is not as high. During the past two or three years we have not fed any wet mashes to our breeding birds, and have fed in place some sprouted grain, but mostly rolled oats in hoppers. As far as we can see at the present time the sprouting does not improve the feeding qualities of grain very much, with the one exception of oats. The palatability of oats is increased considerably. We have made the oats equally palatable by having them rolled or flattened, that is the hull and all.

Feeding when Wet Mashes are Used.

The general method of feeding is to give a mash of mixed ground grains, moistened with water or milk, in the morning; a little whole grain scattered in the straw covering the floor, at noon; and all the whole grain they will eat at night. This latter meal is usually fed in the straw. Some poultry men adopt the plan of not feeding the mash until evening. We have been practising this plan for some time and like it very well. The objection to the former plan is that the hen is likely to become gorged with food early in the morning, and thus take to the roost for the rest of the day, which is usually followed by hens becoming too fat, and the egg record becoming small; but, notwithstanding, many successful poultrymen use this method to advantage. The objection to feeding the mash at night is that it becomes quickly digested, and the bird has not sufficient food to last it during the long winter night; but this objection can be overcome by giving a little whole grain after the mash at night.

Some poultrymen feed their fowls but twice a day, morning and evening, and get very good results; but we favor feeding three times a day. Our plan is somewhat as follows:

Early in the morning the fowls are given half a handful each of whole grain. This is buried in the litter on the floor. Thus the fowls get exercise (a very necessary thing) in scratching for it, and at the same time keep themselves warm. At noon about two handsful of grain are given to a dozen hens in the litter. They are also given all the roots they will eat, either pulped or whole, as fowl relish mangels, sugar beets and turnips. Cabbage also—a very good green food—is sometimes given. About four o'clock in the afternoon they are fed a mash composed of equal parts of bran, shorts, oat-chop, and corn meal (during cold weather), and to this is added about ten per cent. of animal meal, if we have no cut green bone or cooked meat. These foods are thoroughly mixed together in the dry state, after which is added steeped clover, which has been prepared by getting a bucket of clover leaves, or cut clover hay, and scalding it with boiling water. This is done early in the morning, and the bucket kept covered with a thick sack throughout the day. This will be quite warm at night, if it has been kept in a warm place. There is usually sufficient liquid to moisten the meal that has been mixed. Our aim is to have about one-third of the ration, in bulk, of clover. After the mash a small amount of whole grain is fed in the straw. There is—and should be—a plentiful supply of good, *pure water within easy reach at all times.*

To those who keep but a dozen or so fowls, or to those who wish to economize in the feed bills, by using table refuse, such as bread, meat, vegetables, etc., the wet mash system is commendable, in that these cheap by-products, if clean and cooked, make excellent mashes, when dried off with shorts and bran or other chop. This kind of mash usually gives excellent egg yields, and the labor entailed is not a serious consideration, under the above conditions, but it is, at times, where birds are kept in large numbers.

Method of Feeding the Winter Laying Stock at the O.A.C.

We try to simplify our methods and use only common foods, and at the present time we are using as whole grains, wheat and corn. Buckwheat and barley, if available, locally, at economical prices, would be used to supplement the other grains mentioned. Wheat and corn are fed in about equal parts both morning and evening. The corn is cracked before mixing with the wheat so as to render particles of grain more uniform in size, and hence secure more balanced feeding by the birds. All grain is fed in the litter of straw or shavings on the floor of the pen, thereby inducing the birds to exercise. At noon we feed mangels, cabbage or clover hay as green food. Rolled oats are kept constantly before the birds in hoppers, as is also grit and shell material. Buttermilk or soured skim-milk is the only drinking material given when a supply is available, while at other times water is given.

Method of Feeding the Summer Laying Stock at the O.A.C.

At the present time our plan of feeding is to scatter whole grain in the litter, both morning and evening. The grain used is wheat almost entirely. Buckwheat, barley, oats and corn are occasionally used to supplement the wheat. Green food in the form of rape, grass, or green oat crop, grown in the runs or as a soiling crop, is constantly supplied. Sour milk or buttermilk, when available, is given as drink, while at other times water is provided.

INCUBATION.

This is a very interesting topic. Here we are dealing with the renewal of the flock. This has been to the larger grower a difficult problem, and to most farmers and small growers, comparatively easy. (It is apparently easy for the farmer to hatch and rear one hundred or more chicks, and very difficult to get hens to lay during the winter. The larger grower can usually get a fair production during the winter, if he can get the chicks out and well grown.) There are so many factors that may influence the hatch and the vitality of the chicks, that it is at times an impossibility to say why one fails and another succeeds.

The first essential to successful incubation is good, hatchable eggs. The hatching power of eggs is apparently influenced by the parent stock, not only in the present generation, but possibly for generations back. Granting this, we must, then, use only the strongest and best birds as breeders, and if a rigid culling is followed annually, it is our belief that gradually, but surely, the problem will become less difficult. Then, again the methods of housing and feeding are factors. Birds kept in ill-ventilated, damp houses, or under any unsanitary conditions, are lowered in vitality or vigor, which of necessity must be more or less imparted to the germ of the egg. It has been shown under the discussion of foods that the hatch is influenced by the feeds.

The farmer's flock is usually strong and rugged; it has plenty of exercise in the fresh air, and, moreover, is seldom kept in such numbers that the ground about the buildings becomes seriously contaminated. There are, of course, some exceptions to the above statement. Fowls upon the farm are very seldom extensively fed upon meat, or what may be termed forcing foods. Then, again, the unlimited range and the great variety of foods available make the conditions upon the farm excellent for the production of good, hatchable eggs. If more attention was paid to the selection of the males, the results would be improved. The selling of the largest and earliest maturing males, and the breeding of the late hatched, immature, ill-nourished males, is not conducive to progress, to say the least.

The difficulties of the large growers are mainly due to bad housing, yarding, and feeding. Many houses are poorly ventilated, and the yards are small, and the fowls are on them constantly, and are, therefore, in an unsanitary condition; and, furthermore, the lack of a variety of foods and exercise, and the use of animal foods, are also more or less injurious. All these conditions are largely under our control, and many of the failures in the past appear to be directly due to a too intensified condition. It has been many people's idea to see how many hundreds could be kept on the least acreage of land.

Natural and Artificial Incubation.

Whether it will pay to buy the incubators and brooders depends largely on one's circumstances. Where chicks are wanted in considerable numbers, earlier than April 15th, an incubator becomes practically a necessity, as it is seldom that hens become broody in numbers until after the 1st of April. Again, where one wishes to hatch more than one hundred and fifty chicks, an incubator is, in many cases, cheaper and better than the natural methods. It is also a necessity where one is breeding from the non-setting varieties.

There are numerous illustrations of chicks being raised in large numbers by the natural method in the States of Rhode Island and Massachusetts, particularly in the former State. Where this method is followed, the chicks are hatched largely during the months of May and June; and where from five hundred to one thousand five hundred laying hens are kept, there is little difficulty in getting a sufficient number of broody hens. Those who are keeping large numbers of hens appear to be well satisfied with the natural method; but there can be no doubt but that the number of incubators in use is increasing from year to year.

The average hatch is probably one chicken from every two eggs set. This, of course, varies with the different seasons, also with the percentage of fertile eggs, and the strength of the germ. We have found during the months of February and March, when the ground is covered with snow and the fowls are closely housed, that the percentage of fertile eggs is small, and that the germs are very weak. Under such conditions we have very poor hatches and chicks that are very hard to rear. Much better eggs are obtained in December and early January, or when the fowls get out into the fresh air and are able to pick some grass. Thus it will be seen that, as a general rule, as the percentage of fertile eggs increases, the vitality of the germ increases, the percentage hatched is larger and the mortality among the young chicks smaller. For example, we would expect to get a much larger percentage hatch of the fertile eggs from eggs that were 90 per cent. fertile than from those that were sixty per cent. fertile; and, moreover, we would figure on raising a much larger percentage of chicks from the former eggs than from the latter, owing to the chicks being stronger and having greater vitality.

Setting the Hen. It is generally agreed that, in order to secure a good hatch, the hen must be placed where other hens are not likely to disturb her; for, as a rule, we seldom get good hatches when other hens lay in the nest with the sitter. Some farmers do not set a hen until one becomes broody on a nest where no others lay, which often necessitates late chicks. The difficulty can be overcome by making a new nest for the broody hen. Get a box about twelve inches square and six inches deep; put some earth, or an overturned sod in the bottom, taking care to have the corners very full, so that no eggs can roll out from the hen and get chilled; next, put on about two inches of straw or chaff; and then put a few earthen eggs into the nest. Place the nest in some pen where nothing can disturb the hen, and put her on after dark. Feed and water must be within easy reach, and a dust bath should also be convenient. If the hen is sitting quiet the next day, you will be safe in putting the eggs under her. In our experience we get 90 per cent. of the hens to sit by following this method.

It should be remembered that the hen will be in better condition if dusted with insect powder when set, and also a few days before the hatch comes off. This will usually keep the lice in check, especially if some tansy or mint leaves are used in making the nest.

Artificial Incubation.

During recent years many incubator experiments have been conducted here, as well as at other colleges, and some progress has been made. It is our purpose at this time, not so much to go into the details of these, but to give if possible, the best methods we know that can be used by the average person.

Selecting an Incubator. There are many makes of incubators on the market that do fairly good work; they are not perfect, nor have they the hatching power of a normal hen, but then they are always ready to hatch eggs any day of the year, and by their use eggs can be incubated in large numbers. They do not get balky and cease hatching as some hens do—that is, unless the operator fails to do his part. Commercially they are a necessity. To the prospective buyer I would suggest the purchasing of a well-built machine, one that is double cased, and that is easily cleaned, and whose fixtures, such as the lamps, etc., are convenient. We do not know which is the best incubator made.

Recent scientific investigations indicate that it is probable, in some instances, that disease organisms, found in dirty incubators, cause serious harm. Our plan —no matter what the type of machine—is to thoroughly wash the entire interior of every machine before putting in the eggs for hatching. We use a ten per cent. solution of a tarry compound, such as creoline or zenoleum. This helps to clean the machine, and if applied hot, so much the better. We have obtained best results by using water or moisture during the entire hatch. I have seen good hatches from incubators where no moisture was used. We use a pan beneath the egg-tray, nearly the full size of the machine, and keep this pan covered with water, or wet sand, not more than one inch in depth.

Many incubator thermometers are not reliable, and it is, therefore, advisable each season to have the thermometers tested. Any druggist will have a registered thermometer, and can do the testing if the owner does not wish to.

The hatch is made or lost usually during the first week of incubation. Keep the temperature well up to 103 degrees, with the thermometer lying on the eggs, and maintain as even a temperature as possible.

Do not set dirty, washed, small or extra large eggs. The shell is porous and disease germs that may be on dirty eggs might infect a number of eggs. Do not

turn the eggs when your hands are dirty, or immediately after handling lamps or kerosene.

The room in which the machine is operated should be clean and well ventilated. If possible, select a room that varies but little in temperature; in such a room it is easier to keep the hatching chamber of the machine at an even temperature. Where there is a strong odor of lamp fumes, or where there are decaying vegetables, or where moulds grow upon bits of boards or upon the walls, an incubator will not usually do good work. The lamps burn brighter, the eggs hatch better, and the chicks have more vitality when the air in the incubator room is pure.

Operating the Machine.

We have obtained the best average hatches and the best chicks, other things being equal, operating the machines at 103 deg. F., with the bulb of the thermometer resting on the top of an egg; not at the side of an egg nor at the bottom. This heat is maintained throughout the hatch. We are particular to set clean eggs, usually not over two days old, which have been held at a temperature between 55 and 75 degrees. The eggs are best put in the machine in the morning; then the gradual heating of the eggs goes steadily on during the day, and by night we know that the machine is not too hot or too cold. Moisture is used from the start; we are more particular about moisture the first week of the hatch than at any other period. No ventilation is given until after the ninth day of incubation. Our best hatches in nearly all instances are from machines operated at a very even heat, with plenty of moisture, and little or no ventilation up to the ninth day. After this period the eggs need plenty of air and the ventilators opened gradually until wide open at hatching time. The hatch appears to be made or lost during the first week of incubation.

We do not like to let the chicks off the trays or down in the nursery. If they pant, it is nearly always from a lack of air; in such cases we open the door slightly or sufficient to keep the chicks comfortable.

REARING CHICKENS.

Experience would indicate that the best results in rearing chickens are secured where a good soil is used. Light, sandy soil, while draining readily and thus keeping more sanitary than a heavy soil, will often not produce sufficient succulent growth for green food. A heavy, wet soil is to be avoided, as chicks do not thrive well and there is great danger of disease. A combination of high and low land is possibly nearer ideal, using the high land upon which to locate colony houses or coops and the low or bottom land to provide forage. If a never-failing stream flows through the bottom land, as shown in Fig. 39, the location would leave little to be desired.

Growing chickens require plenty of free range. While it may be possible to grow chicks to maturity under intensive conditions, there is a strong tendency to dwarfness and lowering of constitutional vigor, even although in time the chickens may attain full weight. Continued breeding from such stock and rearing under such conditions will, in a comparatively few years, so lower the vitality of the stock that the eggs will become unhatchable. Overcrowding at any and all times is to be avoided. Free range, with plenty of shade, such as a corn crop,

Fig. 39. A Good Location for Rearing Chicks.

orchard, shade trees, or artichokes, and plenty of tender green food and insects will do much towards insuring an economical and vigorous crop of chickens.

Chickens which are taken from the nest or incubator should be put on fresh soil, if at all possible. One should endeavor to so rotate the crops that chickens will not be on the same land year after year. During the first few weeks a chick is out it does not require a large run, but care must be exercised not to keep them confined in small runs long enough to check growth in the slightest degree.

Early hatched chicks will often do better if placed on a grass sod. Late hatched chicks should not be placed on old, tough sod, as the vegetation is so coarse and tough that the young chicks are unable to eat it. In the writers' opinion,

Fig. 40. Good Range for Chick Rearing.

chicks after the middle of May do best on cultivated soil or here their range includes such. The young weeds or plants growing in such a location are readily eaten by the young chicks. If the land is bare of vegetation, a little lettuce, rape, or sprouted oats will be greatly relished by the chicks, and prove very beneficial.

A corn field or cultivated orchard approach very nearly ideal as locations for raising chickens, as they provide shade, fresh, tender vegetation, and a considerable quantity of insect life.

Many people experience much greater difficulty in operating brooders than incubators, and hence prefer to raise the incubator chicks with hens. There are others who have an incubator, but do not care to invest in a brooder. In either case the writers would advise the use of broody hens.

Where it is intended to use broody hens to rear incubator chicks the best plan is to give the hen two or three eggs out of the incubator on the eighteenth day. When the hatch in the machine is completed, take fifteen chicks and give them to the broody hen at night. Little or no difficulty will be experienced in getting her to take them, even if there may be more than one color represented. Seldom will she take them satisfactorily if given to her in the day time. Hens which are to be used for rearing chickens should be well dusted with good insect powder before starting. There is possibly no more potent cause of mortality in hen-hatched chicks than lice.

There are many good brooders upon the market which are well described in the manufacturers' catalogues; hence a description here is unnecessary. The brooder lamp should always be constructed and arranged as to give little chance of fire.

If the brooder can be placed in a small portable house it is a good plan, as the brooder is thus protected from stormy, cold winds in early spring; also from the heat later on. The house protects the chicks from the weather better than a coop would, and serves as a roosting coop after they become too large to stay in the brooder.

This coop can be closed at night so as to keep out all animals that might destroy the chicks. The wire front is necessary to supply an abundance of air.

. ıovable front is a great convenience when the hen is running at large during the day.

The coop is two feet high in front, fifteen inches high at the back, and is two wide by three in length. The wire portion is one foot in width.

In brooding chicks, artificially, one of the most difficult features to control is the temperature. While it is true, that all brooders on the market at present are fitted with automatic regulators, they are not absolutely dependable. In cold weather there is constant danger of chilling of chicks, while in hot weather fires are liable to occur if the lamps are not watched closely. Only the best grade of kerosene should be used, and the lamps trimmed and cleaned frequently. In hot weather it is advisable to lower the flame in the morning and turn it up again in the evening to prevent fire. In the writers' opinion lamp brooders are not safe to use after the end of May.

We try to keep the temperature of the brooder between 95 and 100 degrees (at chick level) throughout the first week. A good guide is to have the brooder just warm enough so that at night chicks will sit around the outside edge of hover with their heads sticking out through the curtain surrounding it. Be careful not to get brooder too hot nor yet too cold, as either extreme is serious and affects the vitality of the chicks. This is very important, especially during the first two weeks. After the first week the temperature is gradually lowered, generally speak-

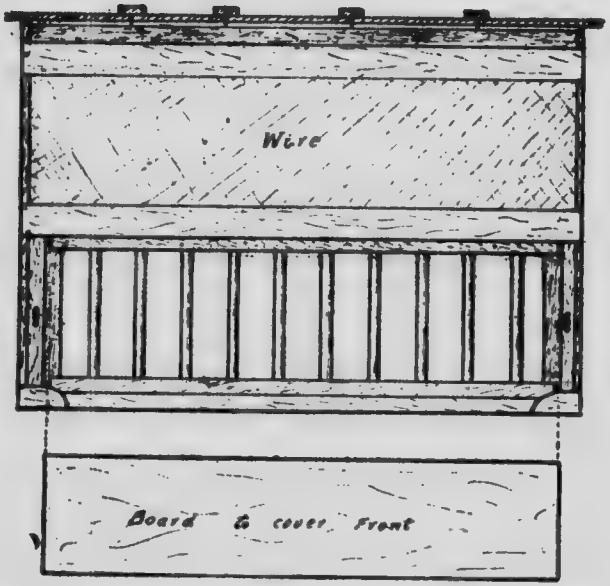


Fig. 41. Front of a Convenient Coop for Hens and Chicks.

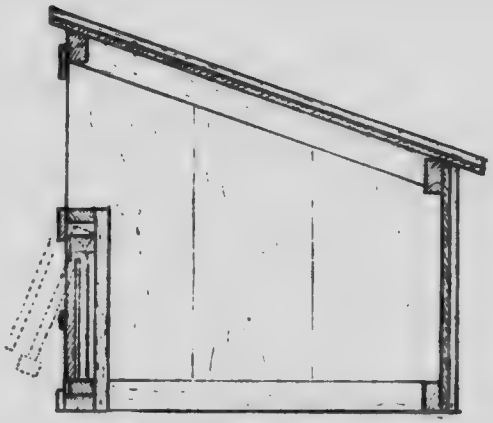


Fig. 42. Cross Section.

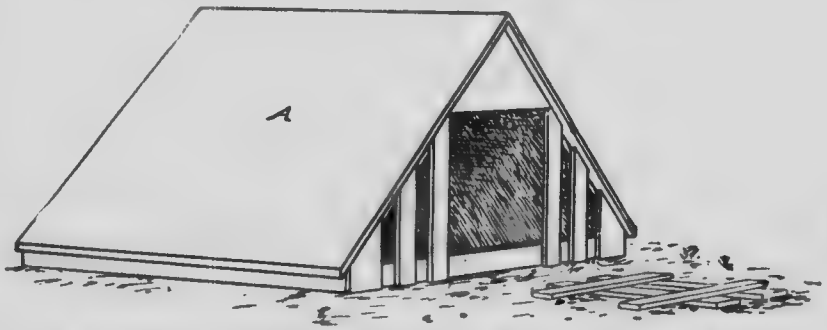


Fig. 43. Coop A.—Each side of roof 24 in. by 30 in.; bottom 2 ft. 4 in.

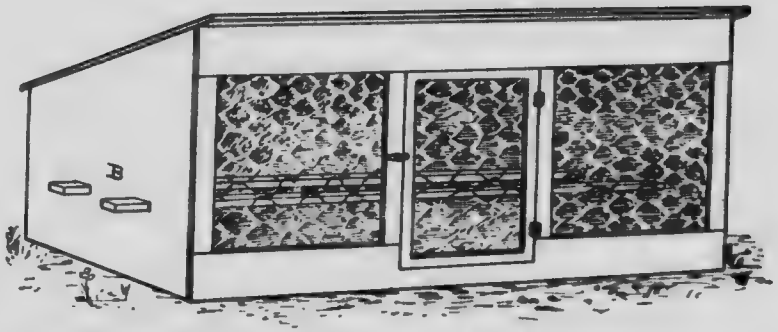


Fig. 44. Coop B.—Length, 6 ft.; width, 2 ft. 6 in.; height in front, 2 ft. 4 in.; height at back, 18 in.

ing about one degree a day. It is well to remember that when chicks are put in the brooder every fifteen chicks will raise the temperature of the brooder about one degree.

It is advisable to start the lamp of the brooder about twenty-four hours before the chicks are to be put in. The floor should be covered with clover chaff or other clean litter. Musty or mouldy litter or feed should never be used about the brooder or pan in which young chicks are to be placed. Lukewarm water is put in the brooder for drink before the chicks are taken from the machine. It is advisable to supply some fine grit or coarse sand, preferably of a bright, shiny appearance.

The use of the large coal-heated brooder is now becoming quite common. This consists of a small coal stove and a large cover or hover. These are made of different capacities, according to the manufacturers, from 500 to 1,000 chicks to the

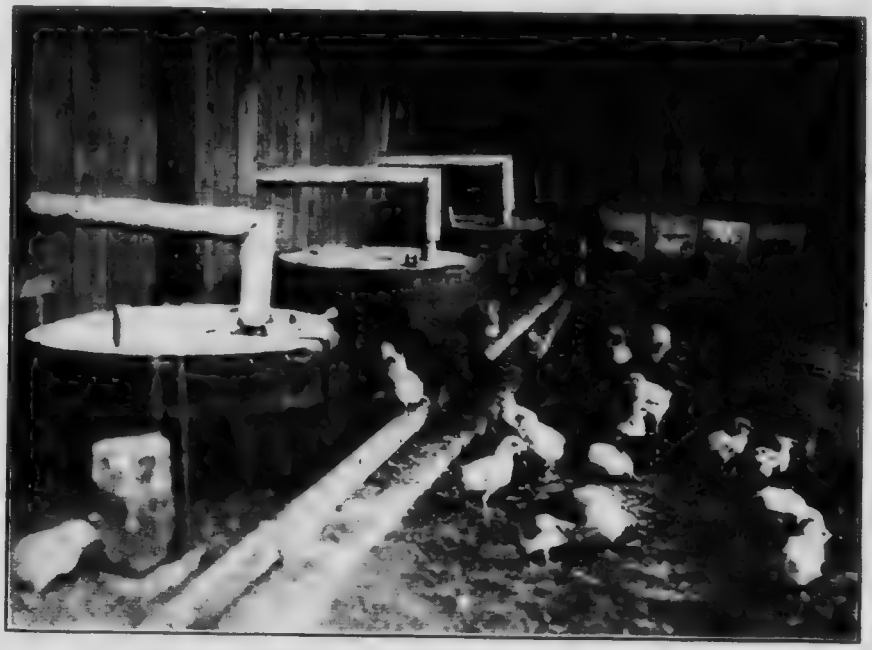


Fig. 45. This cut shows the Method of Brooding, etc.

brooder, depending on the make. It is the belief of the writers that best results will be secured if not over 400 are placed in each brooder stove.

There is no doubt that for the poultryman who is raising chicks in large numbers these coal brooders will be found economical to use. The expense for fuel is not so great as in the case of oil lamps, and the labor of caring for them is much less than the same brooding capacity of oil lamps. The brooding of chicks in large numbers, however, presents problems and difficulties not often encountered where brooding in small flocks. It is seldom that young chicks when brooded in large numbers do not begin crowding, which, if not attended to at once, will ultimately result in disaster. Many have difficulty in feeding chicks in large flocks, either running to one extreme or the other.

Chicks should not be fed until they are sixty or, better, seventy-two hours' old. Many make the mistake of feeding too soon. The young chick at the time it leaves the shell has sufficient yolk attached to the digestive tract to supply it with food for five or six days. Feeding before the yolk is absorbed causes indigestion and bowel trouble in many cases.

Fig. 43. Coop A.—Each side of roof 24 in. by 30 in.; bottom 2 ft. 4 in.

Fig. 44. Coop B.—Length, 6 ft.; width, 2 ft. 6 in.; height in front, 2 ft. 4 in.; height at back, 18 in.

The most successful results are secured where chicks are fed small amounts at frequent intervals. For the first ten days or two weeks feed five times per day at two to three hour intervals. This is for early spring. As the hours of daylight lengthen to 7.15 or 7.30 o'clock p.m. it will be necessary to increase the number of feeds given above from five to six. A suggestive time-table for feeding would be—first feed at 7.00 a.m.; second, 9 a.m.; third, 11.30 a.m.; fourth, 2.30 p.m.; fifth, 5.30 p.m., and, where a sixth feed was given, 7.15 or 7.30 p.m. The object in having the first two morning feeds only two hours apart lies in the fact that the chicks are very hungry in the morning, and by feeding lightly at 7 a.m. and again at 9 a.m. there is not the danger of overfeeding, that there would be were a heavy feed given early in the day.

The writers have had the best success in starting young chicks on rolled oats or stale bread crumbs mixed with hard-boiled eggs (boiled for thirty minutes), in the proportion of six parts of the rolled oats or bread crumbs to one part of the eggs. The eggs are first finely ground, shell and content, and the proportions taken by measure. This is fed dry. After the first two or three days we begin to give an occasional feed of seed chick-food of one of the commercial grades or one made up as follows:

Cracked wheat	35	parts
Granulated oatmeal	30	"
Small cracked corn	30	"
Grit (chicken size)	5	"
Total	100	"

Very few of the commercial grades contain any grit, in which case it either has to be added to the feed or given separately.

Most people experience their greatest difficulty in regulating the amount to feed, and especially for the first three weeks. Some will under-feed, while, again, others will over-feed, both of which are serious. With the object of offering a solution to this question, feeding tests were undertaken to determine whether the feeding of definite amounts at stated intervals would give satisfactory results. Varying amounts of food were given, ranging from one ounce per day to ten chickens, to one ounce per day to fifteen chickens. It was found, however, that the optimum amount required was somewhere between these two points, and proved to be approximately one ounce per day to twelve chickens at the start of feeding. The time at which increase in amount given should take place varies with different lots of chickens, but will ordinarily be about the fourth or fifth day. The rate of increase in amount also varies greatly, and it is sometimes found necessary to discontinue the increase for a short time for some inapparent reason. The rate of increase must be slow, never exceeding one-quarter of an ounce per day to a flock of sixty chickens.

Best results were secured where the food was weighed for each feed. A measure may be used with a fair degree of accuracy, yet the fact that the feeds are for the most part of mash, the weight of the measureful would vary from time to time. Guessing at amounts leaves room for much gambling on results.

The chicks are started on the rolled oat or stale bread and egg mixture, fed five times per day, one ounce per feed, per sixty chickens. This rate of feeding is continued until the third or fourth day, when a small quantity of chick-feed is given at the 11.30 a.m. and 5.30 p.m. feeds in conjunction with the former mixture; the chick-feed serving as the increase. This is continued, gradually increasing the amount of chick-food, until by the twelfth day the flock of sixty chickens is getting five ounces of mash mixture and two ounces of chick-feed. At this time

the mash mixture would be given the first two morning feeds and the first afternoon feed, while the chick-feed formed the last morning and last afternoon feeds. The use of the chick-feed is continued until the chicks are old enough to eat whole or coarsely cracked grains.

After the first week or ten days it may be found necessary to use some kind of filler for one feed—something which is bulky, easily digested, palatable, yet not highly nutritious. Cooked vegetable, such as mangels, turnips, sugar beets,

Fig. 46. Growing Chickens in the Cornfield.

cabbage, etc., dried off to a crumbly state with shorts or middlings, will be found very satisfactory and economical. Stale bread moistened in milk and mixed with one of the meals mentioned above is also good. These are given in such quantities as the chicks will eat, preferably at the 2.30 p.m. feed, removing any food which may be left. We have found it advisable to add from two to five per cent. of bone meal to the mash after ten days feeding, as it materially assists in the formation of bone in growing chicks and to some extent prevents leg-weakness. An occasional feed of powdered charcoal in the mash after the fourth day will assist in correcting digestive disorders and preventing diarrhœa.

Plenty of fresh drinking water must be supplied the young chicks. After the tenth day if sour milk or buttermilk are available they may be given as drink replacing the water. It is not advisable to give milk in any quantity previous to the tenth day, as the chick is in our experience liable to over-feed on it. All milk used should be sour before using.

When the chicks are one week old and confined to pens or houses where they cannot get *green food,* the same *must be supplied.* Lettuce is excellent; sprouted grains are very good, as is also root sprouts, cabbage, rape, etc. The green food is given to supplement the other foods used, and not to replace any of them. Its value is largely in its effect on the bowels and blood.

When feeding chick-food scatter it in the chaff on the floor of the pen. The little chicks will work away most of the day for it after they are one week old. It gives them exercise, which is a necessity in rearing chicks.

When the chicks are four weeks old the number of feeds per day are reduced to four, and when seven, to three feeds daily. The feed at this time may consist of whole wheat and cracked corn, fed morning and evening, and a mash food in the middle of the day. The mash may consist of equal parts of bran, shorts and corn meal, to which is added ten per cent. of animal meal or beef scrap. If we are anxious to force the chicks, we give two feeds of mash per day and increase the animal food a little.

Chicks hatched at a season of the year when they can range out of doors need not be fed as often or as carefully as described above after the first two weeks. During the winter season, where chicks are reared indoors, too liberal feeding often causes leg weakness, etc. In such cases, sweep away the snow and do your best to get the chicks out on the ground. Feed but very little hard grain and use mostly moist mashes. Use as much cooked or raw vegetables as the chickens will eat.

Close confinement, poor ventilation, and feeding of large quantities of hard or dry chick foods to winter broods of chicks have given us very poor results. Watch the chicks, and when you notice some of the largest getting weak on their legs reduce the hard feed and get them out of doors if possible.

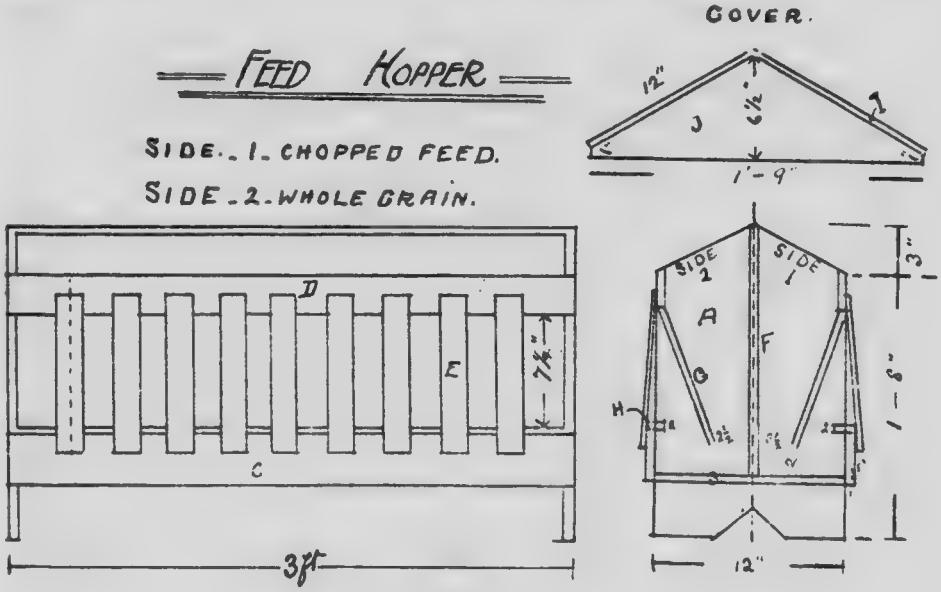


Fig. 47.

BILL OF MATERIAL.

A. 2 ends ⅞ x 12 in. x 1 ft. 8 in.
B. 1 bottom ⅞ x 12 in. x 2 ft. 10¼ in.
C. 2 sides ⅞ x 3¾ in. x 3 ft.
D. 2 sides ⅞ x 2½ in. x 3 ft.
E. 18 pieces ⅝ x 1⅝ x 10 in.
Side 1.—Chopped feed.

F. 1 division ½ x 16 in. x 2 ft. 10¼ in.
G. 2 divisions ½ x 9½ in. x 2 ft. 10¼ in.
H. 2 pieces ¼ x 1 in. x 3 ft.
I. 2 pieces ½ x 12 in. x 3 ft. 2 in. } Cover.
J. 2 ends ⅞ x 6½ x 1 ft. 9 in. }
Side 2.—Whole grain.

We have used for several seasons the hopper plan of feeding chicks during the spring and summer months with good success. We have tried placing a hopper or trough of chick-feed in a coop along with the hen and chicks, and keeping the

supply constant in or near the coop, from the day the chicks were put out until full grown, with most satisfactory results. For the chicks brooded artificially we use very extensively the hopper method of feeding after about eight weeks of age, first with chick-feed and later with whole grain, and find it a very economical method of feeding. Where chickens have a good range about the fields of the average farm, we know of no better plan of feeding chicks. The hopper may be made of any size or shape so long as the supply of grain is constant and the supply large enough to last for about one week. A hopper which slopes from both sides will feed better than one with a slope to but one side.

Where the hopper plan is adopted on the farm, the labor problem is very much reduced. If the hoppers are always kept supplied with grain there will be much less danger of underfeeding and producing s[illegible] chickens. Water or sour milk should be given daily in a clean dish. While [illegible]d, growth may be secured by feeding grain only from the hopper, better and m[illegible]apid growth will be obtained if a moist mash is fed once during the day.

Try to keep your chickens roosting in the open air as long as possible. Be careful, however, to note that the coops or houses which appeared to have plenty of room early in the season are not overcrowded when the chickens become more mature. Never overcrowd, and clean coops or colony houses frequently. Never house the birds in close, stuffy houses. If you do, they will be sure to go wrong, become weak, and be of little or no value, either as breeders or egg producers. When the portable hover is used in a colony house, the brooder is removed from the house as soon as they can be weaned from the heat, and the chi[illegible]ens roost in colony houses until they are ready for market.

There are many advantages in using several small movable colony houses for rearing chickens.

(1) There is no loss of time in teaching the chicks to go from a small coop to a larger one. Movable brooders are used inside the house, and when no more heat is required these are taken out. About this time, low, flat perches are put in the house; the chicks soon commence perching, and thus prevent crowding. One hundred chicks can be put in a house. This house will accommodate fifty chickens of about four or five pounds weight; or until large enough to be fattened or put into laying quarters. Usually some birds are sold as broilers, hence there is not much overcrowding.

(2) The chickens can be reared on a portion of the farm where a full crop, as well as a crop of chickens, can be grown. This usually means new land each season for the chickens, which in turn means stronger and better birds reared with less grain. It also may mean the destruction of many injurious insects. We use the corn fields, pasture fields, and orchards, or any similar condition under which a crop of chickens and an additional crop can be obtained from the land during the same season. Chickens grown on the same land year after year do not thrive as well as those grown on new ground each year.

(3) Should the chickens at any time become destructive they can be moved. We have raised chickens in tomato fields, and if they develop the habit of destroying ripe tomatoes, all that is necessary to avoid further trouble is to shut the chickens in at night, and next day draw the house to a new field and open the door. The chickens will come home to the colony house to roost.

(4) Where there has been considerable grain shelled on the field during harvest, the chickens can be easily moved to the field, and there they will gather the grain.

(5) Any vermin that might worry the chickens at night can be easily kept out by shutting the door.

(6) During rainy or bad weather, the chickens have a place for shelter. This is very important early in the spring and late in the fall.

Cost of Rearing.

We were able recently to keep an exact record of the birds grown in the pasture field, and of those grown in the orchard. The chickens in the pasture field were hatched during the first two weeks in May. Three hundred and forty-five birds were grown to maturity or to a size suitable for fattening. We began to remove the cockerels from the field to the fattening pens on August 25th. The pullets and cockerels held as breeders were all taken from the field by the 22nd of October. The breeds reared were Orpingtons, Wyandottes, Plymouth Rocks, Leghorns, etc. They consumed 1,304 lbs. of grain; of this about one-third would be dry mash;

Fig. 48.—Producing Two Crops in One Season—Apples and Chickens.

nearly 300 lbs. chick-feed, and the balance—wheat, corn and hulled oats—in the proportion of two and a half—two and one. There was five per cent. of beef scrap added to the dry mash. The birds were weighed when taken from the field, weighing 3,341 lbs., or one pound of chicken representing 3.2 lbs. of grain. Some of the breeding cockerels weighed over seven pounds, and the Leghorn pullets did to feed Leghorns, Minorcas, or birds of similar character. These breeds make a three and one-half pound weight, or when they would fatten most economically.

The chickens reared in the orchard varied more in age. The first were hatched on the 25th of April, and the last on July 6th. Most of the birds were hatched in May. We sold 218 as broilers from this lot during July. The later cockerels were removed to the fattening crates as was done with those grown in the pasture field. Most of the pullets were taken out about the 1st of October, and by the 1st of November practically all had been removed, with the exception of about 100; these were cockerels held as breeders, and the July chicks.

We raised in the orchard 733 chickens at a cost of 8,649 lbs. of grain. A pound of chicken equalled 3.34 lbs. grain, or nearly the same as the pasture field chickens.

The figures mean that a farmer can, in his fields, raise a four-pound cockerel for 13 or 14 lbs. of grain. This amount of grain, at $30 per ton, would be worth twenty-one cents. The cockerel would sell in the market for at least forty cents, and, if fattened, would be worth sixty cents. The data we have on hand would

Fig. 49. Colony Houses used for Rearing Chicks. Artichokes growing as Shade for the Chickens.

indicate that it costs about five to seven cents each to hatch the above birds, that is figuring eggs, oil and losses. Several years' figures show that 4 lbs. of grain will produce a pound of gain in live weight.

FATTENING CHICKENS.

The selling of lean chickens is wasteful, to say the least. Much more interest is being taken in this branch of the industry year by year, and in districts where buyers discriminate in prices between the well-finished and thin chickens, the progress has been very pleasing. There are many buyers who now pay a premium for good chickens. The demand for home consumption has increased to such an extent that the supply falls far short, and more than one wholesale dealer in our large cities is fattening the thin chickens sent to market. Some of the dealers have buildings which they are using each year where they are fattening hundreds of birds weekly. They know that the farmer or grower can do this work better and more cheaply, but if he will persist in sending lean chickens to market, and the consuming public demand fat chickens, some one must supply the demand. Some dealers have been trying the proposition in what might be termed a small way during the past two or three years. The business has, as we understand, been profitable, even where the milk was brought in by express and a high rental paid for the building used. Surely if the dealer can buy all the raw materials from the farmer or grower and make a profit, the producer should do as well or better.

There is ordinarily from three to seven cents a pound difference in the price paid for well-fleshed or fattened birds, to that paid for birds just off the range or fields. This means a difference of from fifteen to thirty-five cents on a five-pound chicken, depending upon the quality. Not only does the feeder make upon the gain made while the chicken is being fattened, but the original weight is in-

creased in value by the improvement in quality. There is always a market for goods of prime quality, and the poor quality goes at begging prices when the supply is great.

It is not difficult to produce good chickens. Like other lines of live stock, th. scrub sort are not desirable. Good, thrifty cockerels, either pure-bred, crosses, or grades of such breeds as Rocks, Orpingtons, Wyandottes, Rhode Island Reds, Game, Dorking, etc., make economical gains. It is usually not very profitable to feed Leghorns, Minorcas, or birds of a similar character. These breeds make medium broilers, but rather poor roasters. The birds usually make the greatest gain when about three to four months of age, or at a weight of three and one-half to four pounds. Should the market demand a chicken of more than five and one-half pounds in weight, then it will be required to allow the birds to range longer, and the gain, in our experience, will be hardly as profitable, unless the price paid is higher, at least one cent per pound.

The average birds make the most economical gains during the first two weeks of feeding. It does not pay to feed longer than three weeks, unless one is preparing birds for a specially select trade paying fancy prices.

Chickens can be taught to eat by lamplight, and where one's time during daytime is otherwise occupied, this feature is very convenient. After November 1st, or even earlier, we feed but few chickens during daylight. They are generally fed twice each day, and not more each time than they will consume quickly.

Construction of Fattening Crates.

Fattening crates are usually made 7 ft. 6 in. long, 18 to 20 in. high, and 18 in. wide. The crate is divided into three compartments, each holding from four to five birds, according to the size of the chicken.

The crate is made of slats, except the ends and partitions between the compartments, which are solid wood; those on the top, bottom and back running lengthwise of the coop, while those on the front run up and down. The slats are usually 1½ inches wide and ⅝ inches thick. Those in front are placed two inches apart to allow the chickens to put their heads through for feeding. The slats on the bottom are placed about ¾ in. apart, so as to admit of the droppings passing through to the ground. Care should be taken not to have the first bottom slat at the back fit too closely against the back. An opening between the first slat and the back prevents the droppings from collecting and decomposing. The slats on the top and back are usually two inches apart.

There is a small V-shaped trough arranged in front of the coop for feeding and watering the chickens. This trough is from two to three inches deep and is generally made of ¾ in. lumber.

Very fair coops may be made from old packing boxes, by taking off the front and bottom, and substituting slats in their places. (See Fig. 50.) During warm weather these crates may be placed out of doors. They need to be protected from the rain, which is easily accomplished by placing a few boards over them. In cold weather the crates should be placed in a house or shed where they are protected from raw, cold winds. When fattening chickens inside of a building, it is well to darken the building and keep the birds as quiet as possible.

After each lot of birds is killed, we paint the crates with some liquid lice-killer. Coal-oil and carbolic acid is very good. Use one gallon of coal-oil to one pint of crude acid. We have used some of the prepared mixtures with good results. If the birds (bought from different parties) are very lousy when put up,

they should be well dusted with sulphur or good insect powder. The birds should be watered at least twice every day in warm weather. Grit should be given them twice a week.

During the first week feed lightly—never quite all the birds will eat. We prefer feeding twice a day during the entire feeding period. Chickens weighing

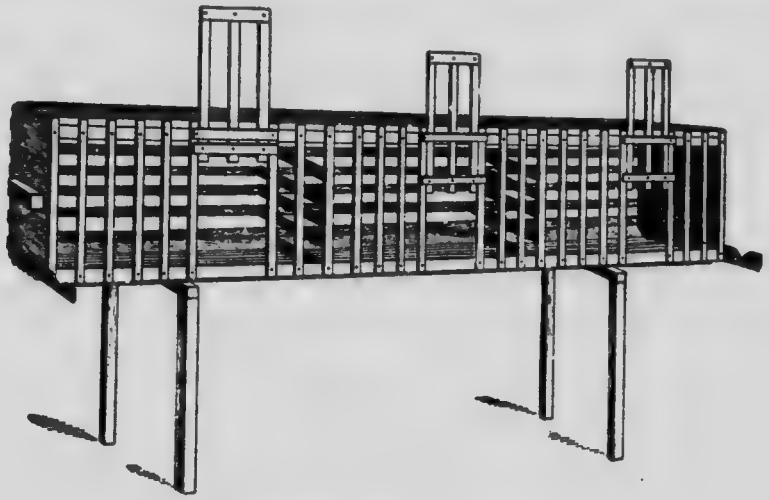


Fig. 50. Showing a Single Crate or Coop.

from three to three and one-half pounds each that are thrifty and of good breeding, appear to be the most profitable for feeding. Large chickens, weighing from five to six pounds, gain less and eat more than the smaller ones.

Should a bird become sick while in the crate we find that if it is given a teaspoonful of salts and turned out on a grass run it will usually recover.

Cramming Machine.

The crammer consists of a food reservoir, to the bottom of which is attached a small force-pump moved by a lever and treadle, which is worked by the foot of the operator.

Communicating with the pump is a nozzle, through which the food passes to the bird.

"A" is the food reservoir; "B" the pump; "E" the pump rod; "O" the lever, which on being depressed at the lettered end causes the pump rod "E," to which it is attached, to move downwards, and to eject the contents of the pump "B" out of nozzle "K." On relieving the pressure at "O" the lever and the parts connected therewith are drawn up by the spring "C" until the motion is arrested by a stop "M," which serves to determine the quantity of food ejected at each depression of the treadle.

The charge may also be varied by arresting the pressure at any point in the downward thrust of the lever "O."

The illustration (Fig. 51) shows one method of operating with this crammer, and this plan is now largely followed in some parts of Sussex, England.

Kind of Food Used in Cramming Machine.

Not all kinds of food can be used in the machine. The food must be in a semi-liquid condition in order to pass through the machine. This necessitates the use of some kind of grain that will stay in suspension in the milk, beef broth, or whatever liquid is used in mixing the grain. Finely ground oats, with the

Fig. 51. Cramming Machine for Forced Feeding of Chickens, Turkeys, etc.

hulls removed, or shorts, answer the purpose well. We use almost entirely the former food. Grains, like corn-chop or barley-meal, are not suitable.

The food is mixed to the consistency of ordinary gruel, or until it drips from the end of a stick.

Will it Pay to Buy a Cramming Machine?

For the ordinary person we think not. First-class chickens may be had by feeding in the crate from the trough only; indeed, we have had equally fleshy birds that have been fed for four weeks from the trough as where we have fed them two weeks from the trough and one week from the machine.

Where one has a special trade for high-class poultry we are of the opinion that a more uniform product can be secured by using the machine. Machine-fed birds should realize at least one cent more per pound than trough-fed birds in order to pay for the extra labor, etc.

Birds that are fairly well fleshed when put into the crate will do better, if put at once on the machine, instead of being crate-fed first.

Crate Feeding *vs.* Loose Pen Fattening of Chickens.

The term "fattening of chickens" has been in use for some time, out it does not exactly convey the meaning intended by the feeders of chickens. The object

is to make the chickens more fleshy, with just sufficient fat to make the chicken cook well. The chickens are not intended to be abnormally fat, yet at the same time they carry considerable fat well intermixed with lean meat.

We have for a number of years conducted experiments with chickens in crates and in loose pens. We have tried about six different feeders and the results vary. With some feeders we had equally as good results with birds in crates as with them in loose pens. We have had two feeders in particular who could not feed birds to advantage in loose pens as compared with crates. We have had one feeder who could get slightly better returns in some cases, not all, with birds in pens as compared with crates.

In speaking to the buyers of chickens, the majority of them seem to think that the crate-fed birds are much superior to those fed in loose pens. Personally, we would prefer feeding birds in crates, for the reason that it takes less room, and we believe that we can feed them with less expenditure of labor and get a more even product. There are now many people who can get good results from feeding birds in box stalls, etc. No matter which method is followed, cockerels should be fed for two weeks or more before they are killed and sold.

How to Feed.

We receive a number of inquiries as to how we feed the birds that are being fattened. Most inquirers wish to know the exact amount fed each day.

It will be noticed that we fed very lightly at the beginning—a very important point—and that the amount was gradually increased until such times as the birds refused to eat all that was given them. No feed was left in front of them longer than ten minutes after it was placed in the trough. Any food left after such time was removed.

Table showing amounts fed morning and evening to two lots of four birds each. The first lot shows steady increase in amount fed, while the second shows irregular increase.

Dates	LOT No. 1				LOT No. 2			
	Morning		Evening		Morning		Evening	
	Meal	Milk	Meal	Milk	Meal	Milk	Meal	Milk
Oct. 10	..... oz.	..... oz.	4.5 oz.	6.25 oz.	..... oz.	..... oz.	5.0 oz.	7.5 oz.
" 11	5.0 "	7.5 "	5.5 "	8.25 "	5.0 "	7.5 "	6.0 "	9.0 "
" 12	6.0 "	9.0 "	6.5 "	9.75 "	6.5 "	9.25 "	6.0 "	9.0 "
" 13	7.0 "	10.5 "	7.0 "	10.5 "	6.0 "	9.0 "	5.5 "	8.25 "
" 14	7.0 "	10.5 "	7.0 "	10.5 "	6.0 "	9.0 "	6.5 "	9.25 "
" 15	7.5 "	11.25 "	7.5 "	11.25 "	6.0 "	9.0 "	5.5 "	8.25 "
" 16	7.75 "	11.75 "	7.75 "	11.75 "	6.0 "	9.0 "	6.0 "	9.0 "
" 17	8.0 "	12.00 "	8.25 "	12.00 "	6.5 "	9.25 "	7.0 "	10.5 "
" 18	8.5 "	12.25 "	8.75 "	13.00 "	8.0 "	12.0 "	8.0 "	12.0 "
" 19	9.0 "	13.50 "	9.25 "	14.00 "	8.0 "	12.0 "	9.0 "	13.5 "
" 20	9.5 "	14.25 "	9.75 "	15.75 "	10.0 "	15.0 "	10.0 "	15.0 "
" 21	10.0 "	15.00 "	10.25 "	15.25 "	10.0 "	15.0 "	9.0 "	13.5 "
" 22	10.5 "	15.50 "	10.75 "	16.00 "	9.0 "	13.5 "	9.0 "	13.5 "
" 23	11.0 "	16.50 "	11.25 "	16.75 "	10.0 "	15.0 "	8.0 "	12.0 "
" 24	11.25 "	16.75 "	12.00 "	18.00 "	10.0 "	15.0 "	10.0 "	15.0 "

It is difficult to give a ration suitable for fattening chickens and that meets the requirements of every individual. Many of us have to use whatever foods are available, and for that reason we are giving several rations that have worked

fairly well with us in a general way. It may be said that the grains in a ration should be ground as finely as possible, and further, some grit should be fed to the chickens at least once a week, and it is also desirable that the food should be mixed to the consistency of a pancake batter, so it will pour; and moreover, the best results are secured when the food is mixed twelve hours previous to feeding.

The best ration that we have yet used is one composed of two parts of finely ground oats, two parts of finely ground buckwheat, and one of finely ground corn; to this is added sufficient sour milk to make a batter or ordinarily about two to two and one-half pounds of milk to one pound of grain. We have gotten very good results from a ration composed of equal parts of corn meal, middlings, and buckwheat meal. Frequently barley meal can be substituted for the buckwheat, or oat meal for the middlings. It is desirable, if possible, to always use milk, as much better gains are made with it than any other food. Where milk is not available, blood meal and beef scrap can be substituted, but we would not advise more than fifteen per cent. of the grain ration to consist of these foods. We would advise soaking the blood meal or beef scrap in warm water for twelve hours previous to being mixed with the grain. We have gotten better results in some cases and equally as good in all cases by feeding any of the above mixtures cool or cold rather than warm—that is to say there were no better gains made by keeping the food at 70 or 80 degrees than at 35 or 40.

It is of the utmost importance that the birds be kept with keen appetites, as a little over-feeding on the commencement usually means indifferent gains. One should be careful to have the birds free from lice or other insects, and as far as possible to keep them in a cool, comfortable place, rather secluded, so as not to be disturbed by the visiting public or other chickens. The birds should be dusted with a small amount of sulphur or other insect powder in order to keep the lice in check. If the sulphur is used too freely it produces a scaly appearance on the birds when dressed.

We have a surplus of cockerels each year over and above those required for breeding purposes, and a number of these are fattened and killed; a few are sold to farmers or breeders. Cull pullets are also fattened. A year or so ago we kept close record on our crate feeding work with the above-mentioned birds, and they showed very good returns. From September to December we put in the fattening crates six hundred and twenty-six birds. The loss by death among these was two birds. The birds weighed (when brought in from the range, usually with full crops) two thousand two hundred and thirty-three pounds. They were fed from four days to three weeks before killing. We hoped to have fed them all three weeks, but at times the demand for dressed chickens required us to kill the birds shortly after cooping.

Rations.

The main ration consisted of barley meal, low-grade flour, middlings and buttermilk. Some other mixed grains were used and a little shredded wheat. The six hundred and twenty-six birds ate two thousand and fifty-seven pounds of ground grain and four thousand pounds of milk.

Many farmers and others market their birds in a thin condition. We can, for the time it takes to feed, clean out the pens, etc., make at least fifty cents per hour over and above the cost of feed. We usually feed these birds by lamplight at night, so that little valuable time is lost.

FINANCIAL STATEMENT OF FATTENING CHICKENS.

626 chickens weighing 2,233 lbs. at 8c. per lb., live weight	$178 64
2,057 lbs. of grain at $1.50 per cwt.	30 85
4,000 lbs. buttermilk at 10c. per cwt.	4 00
Total cost	$213 49
624 dressed chickens, bled and plucked, but undrawn, 2,358 lbs. at 12½c. per lb.	294 75
Profit	$81 26

Birds that are starved ready to kill shrink 12 per cent. by bleeding and loss of feathers. We have figured frequently that the average profit per bird in three weeks' feeding was about fifteen cents each; the above table shows nearly thirteen cents. The profit would have been somewhat higher if all the birds had been fed at least two weeks.

During the fall of 1916 crate feeding was done by some students at the College. These men were inexperienced, and their results could hardly be expected to equal those of professional feeders. They fed seventy birds, composed of practically all breeds and varieties, both light and heavy, and both pure and crossed. Their results were as follows:—

70 chickens weighing 287 lbs. 6½ oz., at 14c. per lb., live weight	$40 24
250 lbs. 5 oz. grain at $2.00 per cwt.	5 01
390 lbs. 13 oz. buttermilk at 30c. per cwt.	1 18
Total cost	$46 43
70 chickens, bled and plucked, but undrawn, 317 lbs. 7 oz., at 20c. per lb.	63 50
Profit	$18 07

These birds, when starved ready to kill, showed a shrink of 11.15 per cent. in bleeding and plucking. The birds, while only fed for two weeks, still showed a return of practically thirteen cents per bird per week, as in the former case. They required 3.6 lbs. of grain for one pound of gain in flesh. As in the case of past feeding trials, the light breeds, such as Leghorns, required from one and one-quarter to one and one-half pounds more grain for a pound of gain than did the heavier breeds. In respect to the profits, those from the heavier breeds were practically double what the light breeds were.

KILLING AND DRESSING POULTRY.

All birds should be fasted for twenty-four hours before killing, and during the period of fast given some water to drink. If this is not done, the food remaining in the crop and intestines at the time bird is killed decomposes. As a result of this decomposition of food in the digestive tract, strong-smelling gases are liberated which taint the flesh of the bird, not only destroying the flavor, but very much lowering its keeping qualities.

All birds should be killed by bleeding, preferably through the mouth. This is a very simple operation, and a little practice will ordinarily make one fairly handy at this work. Two general positions for the bird during the operation are used. The one is to place the bird on a padded bench or table, and the other is to hang the bird up by the feet with a small rope or cord. For the average person the latter method is to be preferred, as there is less danger of bruising or barking the skin

than where the bird is lying upon some object. The one end of rope or cord may be fastened to a small rod or pole and to the other end attach a small block about 2 in. x 2 in., as shown in Fig. 52. Where hanging the bird up, the end of the rope

Fig. 52. A. Rope and block for hanging bird up with. B. Killing knife. C. Blood can. D. Pinning knife.

Fig. 53. Killing and plucking chickens.

with block on is placed around the feet and the block dropped in between the bird's feet and rope. This holds bird without tying, and should be so adjusted that bird's feet are about on a level with the picker's shoulders.

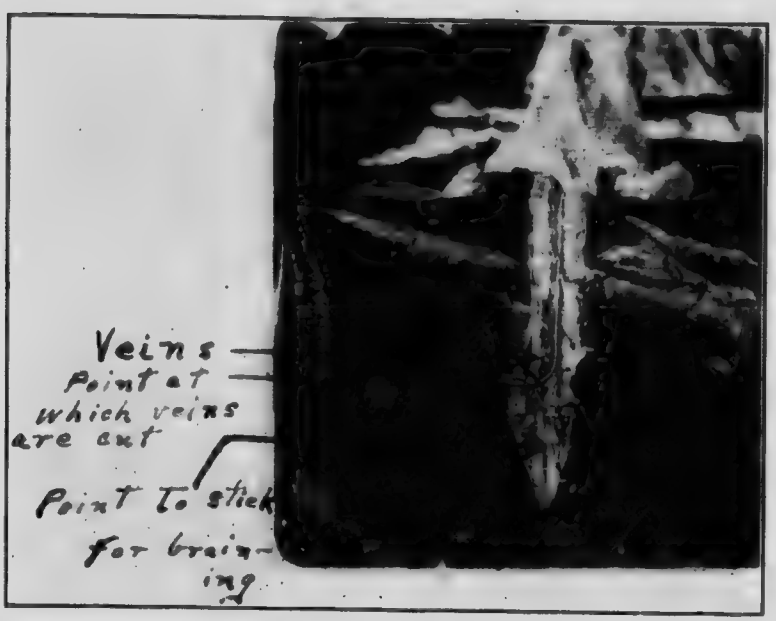


Fig 54. Cut showing location of veins and point for sticking brain.

For bleeding a sharp knife with a blade about three inches in length will answer. A regulation killing knife is shown in Fig. 52. To bleed, catch the bird's head with the thumb and forefinger just at the juncture of the neck and

Fig. 55. Bleeding Operation.

head or at the ear-lobes, as shown in Fig. 55, then with the third finger open the chicken's mouth. Next insert the knife and put down the throat practically the length of the blade, then with the edge of blade turned down, cut rather heavily

with a drawing stroke of the knife. The object is to sever the jugular veins at the point where they unite back of the head, as shown in Fig. 54.

The bird should bleed freely if the cut is made at the proper point. Next, turn the blade of knife over and insert the point of blade in the slit or groove in roof of mouth, as shown in Fig. 54, and then quickly push backward so as to pierce the brain. If the back of the knife is kept on a line with and touching the point of the bill, the blade will pierce the brain. One can tell when this is done as the chicken will squawk. If the bird does not squawk the brain is not pierced, which means tight feathers and hard picking. As soon as the sticking operations are completed attach a blood-can to the lower bill. This catches the blood, thus preventing it being thrown about, and the can being weighted tends to hold the bird still. For a blood-can, any can which is small and to which a small hook can be attached will answer the purpose. In Fig. 52 is shown a style of blood-can which is used extensively in packing-houses. In this can the hook is solidly

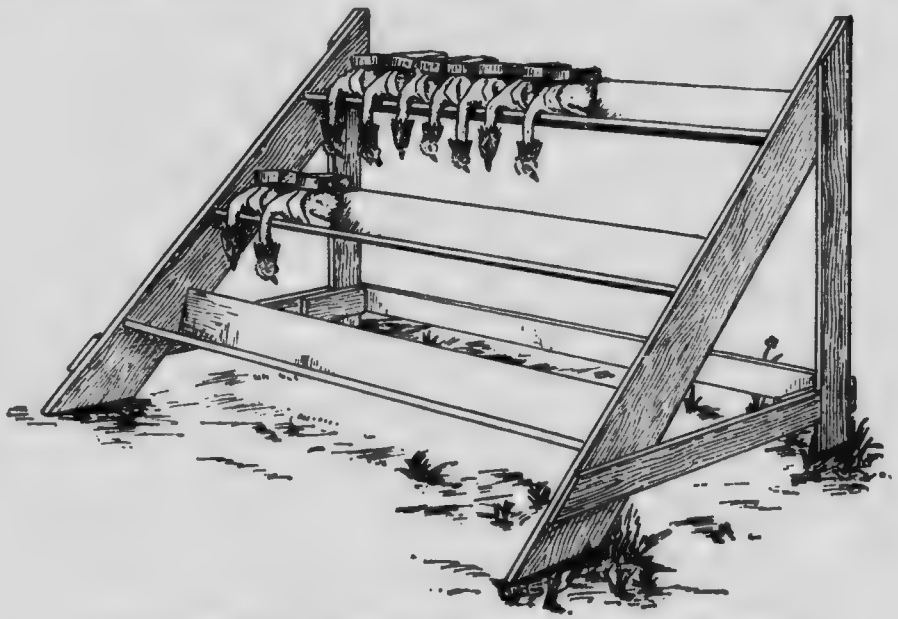


Fig. 56. Showing a Number of Chickens in the Shaping Boards.

attached on the inside of the can near the handle. The weight in can is provided in the form of three-quarter inch of lead in the bottom. Cement or a small stone will answer the purpose equally as well.

The chicken should be plucked immediately, first removing the long wing feathers and tail feathers, then each side of the breast, then the legs, and lastly the back. Do not try to pull the feathers either forward or backward, but more sideways or at an angle. The rough or coarse feathers should be removed in the shortest time possible, as the more quickly the feathers are removed after sticking the easier they will come and the less danger there is of tearing the skin. For instance, in removing wing feathers grasp both wings in the left hand and the feathers of both in the right, removing them all at one stroke of the right hand. Next, raise the right hand to the tail. grasping all the feathers in the tail, and with a slight twist remove with a second stroke of the right hand, and so on over the different sections of the body. To remove the pin feathers use a dull, round-bladed

knife, similar to an ordinary paring knife. (See Fig. 52.) Be careful not to rub or bark the skin. This may be done very easily by rough handling, or by placing the chicken in contact with coarse clothing, hence do not put chicken on your lap to pluck it. If you should, unfortunately, tear the skin, hold the skin at the torn part tightly to the body between the thumb and first finger, and then

Fig. 57. Cooling Rack.

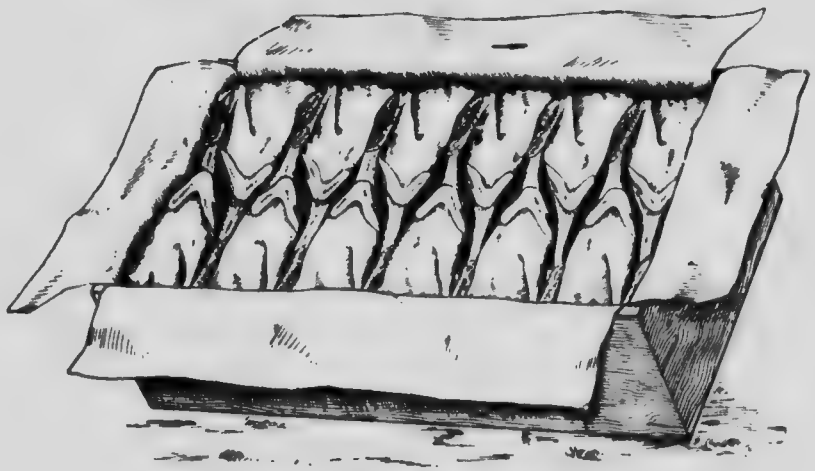


Fig. 58.

remove the rough feathers near torn part. Anyone with a little practice can remove the rough feathers in from three to five minutes. Expert pickers will do it in from three-quarters of a minute to one minute.

The birds should be plucked clean, the blood washed from the head and out of the mouth and the feet washed clean.

After the chicken has been plucked it should be placed on a shaping board, as seen in Fig. 56, or a cooling rack, Fig. 57. In the case of the shaping board, the

weight placed on the top of the chicken is used to give it a compact appearance. The weight may be of iron, as seen in the cut, or a brick may be used in its place. The cooling rack allows free circulation of air around the birds, resulting in more rapid cooling, which on large packing plants is very important, and hence we find the cooling rack in common use in such places.

Many good chickens are spoiled by being packed before they are thoroughly cooled. Care should be taken that all the animal heat is out of the body before the birds are packed. We find it advisable to cool the birds at least twelve hours before packing them.

In packing birds for shipping, they should be packed in boxes holding one dozen birds to the box. The size of the boxes varies with the grade or size of chickens packed in them, but should be such that when chickens are packed they are absolutely tight, so that there is no possibility of them shaking about, and becoming bruised. The boxes are best made of basswood or similar wood, free from odor, as otherwise the flesh of the birds will absorb the odor, thereby tainting the flesh. The box is lined with parchment paper, and, if the chickens are to be shipped a long distance, each bird is wrapped in parchment. This prevents the chickens bruising each other, and, at the same time, to a considerable extent, checks decomposition. Do not use ordinary wrapping paper, as it draws dampness and will cause the chickens to become clammy, which makes them more or less unsaleable. Fig. 58 shows one method of packing in common use, and is termed the "side pack," *i.e.*, the birds are so placed in box as to show the entire side.

The dimensions of some of the boxes are: for broilers, weighing about twenty-four pounds per dozen, 16 in. x 15 in. x 3½ in. inside. This is where they are packed in single layer, with the breasts up and the legs extended. For chickens weighing thirty-six to forty-two pounds per dozen, a box 23 in. x 15½ in. x 4 in. inside would do. One dozen roasters, weighing four to four and one-half pounds each, a box 32 in. x 19 in. x 4 in. inside. For heavy roasters, weighing five to five and one-half pounds each and packed single layer, a box 33 in. x 20 in. x 4¼ in. inside measurement. The material used varies in thickness from one-quarter inch for sides, bottom, and top, and one-half inch for ends in the smallest size boxes to one-half inch for sides, top and bottom, and seven-eighths inch ends in the largest boxes.

(The writers wish to acknowledge the use of "Poultry Packers' Guide" in preparation of box dimensions above stated, for which credit is hereby given.)

Poultry and Eggs for Market.

The profit for poultry and eggs depends upon the cost of production and the selling price. Some excel as producers and others in the disposal of the product. The variation in the prices realized by the producers in the many markets of the province, and at times the margin between what the producer receives and the consumer pays makes one consider what is wrong with the marketing system.

Our market conditions change annually, and at times weekly, if not daily. We are now exporting eggs; the demand is great, the prices good, and furthermore, the home consumption is said to have increased. People are eating more eggs each year. These factors go to make a healthy condition. There can be no doubt but eggs and poultry are placed on the market in better condition each year, which means more money to the producer and better satisfaction to the consumer, and in turn the consumption is increased. We are doing better, but could do more. It is our duty as good citizens to produce many more eggs and meat to assist the

Mother Country. Those of us who cannot go to the war should do our best to produce as much produce as possible and get it to the consumer or cold storage quickly.

In the producing sections situated away from the centres of consumption the selling of the produce for its value is a problem. There are two things that would assist in solving this problem. One would be for the buyer, whether dealer or grocer, to buy the produce on the quality payment basis; and the other is selling through co-operative organizations. Which is the better method depends entirely on local circumstances. A co-operative society situated away from large local markets, when well managed, should be the better method; on the other hand, payment on the basis of quality is simple and just. These problems can be best solved by the producer and dealer getting together. Co-operative buying and selling is the ideal method, but everybody must work together and stay with association. It is seldom that a co-operative society or joint stock company does not have poor years and unsatisfactory conditions. Success depends on united effort.

Fig. 59 A.

Fig. 59 B.

Showing Good (A) and Poorly-fleshed (B) Birds.

There appears to be a general idea that the shell of an egg protects the contents against all kinds of germs and weather; that the outside of the shell may be filthy, but that the interior is not in the least affected by the filth on the outside.

There is nothing more disgusting than at the breakfast table to break a bad egg. No more eggs are wanted for days, perhaps for weeks, and consequently egg consumption decreases; or eggs are looked upon as a doubtful source of food. Many bad eggs are due to ignorance on the part of the producers and consumers, and many dealers are as careless in their methods.

The shell of an egg is porous, or is full of very small holes. The egg is designed to hatch a chick. The chick under favorable conditions grows inside the shell, and finally bursts it open. The holes in the shell supply the chick with air as it grows, also allows the bad air to escape. Science has proved this, but we have ample illustration in practical work. Eggs that become badly smeared with broken eggs in the nest during incubation usually rot, owing to the breathing holes becoming plugged or blocked by the broken egg content. Greased eggs will not hatch for the same reason; and we might mention several other examples.

Knowing that the shell is porous, we can readily understand how minute animal or plant life, or germs, may enter the eggs. Let us take a common case of mouldy or musty eggs. Frequently the paper fillers of egg boxes will become damp due to the boxes being left in a shower of rain or something of the kind. The fillers are only slightly damp, and we think they will do. If no eggs are put in the boxes, and the boxes with fillers are set aside for, say, a week or so, when they are opened they smell musty, and if the fillers are examined we will see slight developments of moulds here and there. Now in cases where eggs are put in such fillers they soon become musty, and when they are left in for some time they become mouldy, not only on the outside of the shell, but on the inside as well. The writers have taken clean eggs on the day they were laid, and put them in dry paper boxes which were slightly mouldy, and set them aside in a dry cellar for a period of a few weeks, and at the end of this time many of the eggs had well-developed mould on the inside of the shell.

Many eggs are spoiled by being partially incubated. Most people believe that an egg must be set under a hen, or put in an incubator before it will start to hatch. Eggs will start to hatch at less than 90 deg. of heat. Many eggs are submitted to this or higher temperatures for several hours, if not days, before reaching the consuming public. When the germ inside the egg commences to develop, the edible qualities of the egg are lessened, or the egg goes off flavor. Eggs may be kept at an incubating temperature for a day, when the chicks will start growing; next day the temperature may be so low that the chick is killed, and from that point decomposition begins, possibly slowly, but, nevertheless, the egg is gradually going bad.

There are almost innumerable ways in which eggs may start hatching during the summer, such as forgetting to gather the eggs daily, and leaving some under broody hens over night, leaving them exposed to the sun or in warm rooms, stores, cars, etc., or even in the kitchen cupboards.

No one can guarantee eggs to their customers during warm weather unless the males are removed from the flock. Unfertilized eggs are essential. We may at home take every precaution, but who knows where or how the cook may keep those eggs, even after they have passed from the dealer's hands. The allowing of males to run with the hens all summer costs the Ontario growers a large sum of money. The writers have stood by candlers in a large packing house, and saw over twenty of the thirty dozen eggs in a case that were more or less incubated, most of the eggs being about forty-eight hours on in incubation. The dealer is thus foced to make prices to meet this shrinkage; at times the public may get "bargain" eggs.

Filthy eggs, or even washed eggs, may be decomposed or rendered useless from the germs in the filth on the eggs. Washed eggs, if used immediately, are good, but they deteriorate very quickly after washing.

Flavor of Eggs.

Many of us forget that eggs will absorb odors. They will not absorb odors as readily as milk, but, at the same time, care should be taken in keeping the storage room for eggs free of strong odors. For instance, to put eggs alongside of onions, turnips, or similar strong smelling foods would mean that the eggs would absorb more or less of these flavors.

Again, the food that a hen consumes very materially affects the flavor of the eggs. This can be very easily demonstrated by feeding mostly scorched grain,

or giving large quantities of pulped onions in a mash food. One demonstration will convince anyone that eggs have been scorched, or taste of onions no matter how cooked.

When hens get but little grain food during the summer and are forced to hunt for their living over manure piles, and catch insects, the yolk will become almost red in color. These eggs make the consumer remark that winter eggs taste better than summer eggs. Frequently feeding as above produces a thin, watery white, and the egg has not only a bad flavor, but has poor keeping qualities, and, moreover, is little better, if as good, as a fair pickled or cold storage egg.

Market Terms Used. A new-laid egg means an egg that is under five days of age, or at least not over one week old. It should be clean, and the boxes should be clean.

Fresh eggs are very very hard to define. With some they mean eggs from one day to three weeks or even more of age, while with others they mean eggs just out of cold storage.

There are several other market terms, such as pickled, held, etc., which are used mostly by the dealers, and need no explanation here.

STANDARDS FOR CANADIAN EGGS ADOPTED BY THIRD ANNUAL CONVENTION CANADIAN PRODUCE ASSOCIATION,

GUELPH, JANUARY 11 AND 12, 1915.

(Revised at the Fifth Annual Convention, Montreal, February 6th and 7th, 1917.)

CLASSES AND GRADES.

Classes—	Fresh Gathered.	Storage.	Cracked and Dirties.
Grades—	Specials		
	Extras	Extras	
	No. 1's	No. 1's	No. 1's
	No. 2's	No. 2's	No. 2's

Allowance for deterioration in transit 10 per cent., but none bad, *i.e.*, eggs should grade at point of delivery 90 per cent. of grade named at point of shipment.

DEFINITION OF GRADES.

Specials—Eggs of uniform size weighing over 25 ozs. to the dozen or over 47 lbs. net to the 30 doz. case; absolutely clean, strong and sound in shell; air cell small, not over 3-16 of an inch in depth; white of egg to be firm and clear and yolk dimly visible; free from blood clots.

Extras—Eggs of good size, weighing at least 24 ozs. to the dozen or 45 lbs. net to the 30 dozen case; clean; sound in shell; air cell less than 5/8 inch in depth; white of egg to be firm and yolk slightly visible.

No. 1's—Eggs weighing at least 23 ozs. to the dozen or 43 lbs. net to the 30 doz. case; clean; sound in shell; air cell less than ½ inch in depth; white of egg to be reasonably firm; yolk may be quite visible but mobile, not stuck to the shell or seriously out of place; cell not necessarily stationary.

No. 2's—Eggs clean; sound in shell; may obtain weak, watery eggs and eggs with heavy yolks, and all other eggs sound in shell and fit for food.

Definitions of grades in class "Cracked and Dirties" to be same as for grades in Fresh Gathered class, except that the terms referring to soundness and cleanness are not to apply.

To measure accurately the depth of the air cell the following method must be adopted. Measure from the points indicated by the arrows.

Pullet Eggs.—Eggs which have the quality of Specials and Extras, but which fall short in weight, shall be known as *Pullet Specials*, or *Pullet Extras*, providing they weigh at least 23 ozs. to the doz., or 43 lbs. net to the 30 doz. case in the instance of the former, and 20 ozs. to the doz., or 37½ lbs. net to the 30 doz. case, in the instance of the latter.

Where and How to Keep Eggs.

The nests in which the hens lay should be clean. These usually need cleaning monthly. The best material we have used for nests is shavings.

Eggs should be gathered twice each day, and placed in clean basket, pails, etc.

The room should be cool, not higher than 60 degrees if possible, and it should be dry. A cool, dry cellar will answer nicely.

The dirties, small, extra large, and found nests of eggs should not be sold. Use them at home. The large ones break in shipping and the smalls and dirties are not wanted on the market. These sell the good eggs at poor prices.

Where one is trying to supply private customers, or a select wholesale trade, it is wise to stamp the eggs with your own initials, or the name of your farm. This is some guarantee to the buyer.

Never Try to Deceive the Dealer.

You may sell bad eggs to the grocers, but the honest people in the district do not get full value for their good eggs.

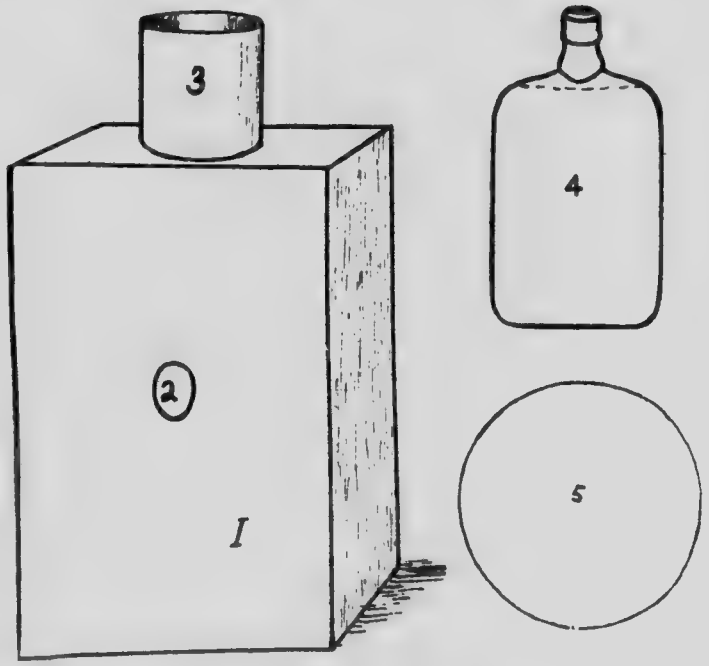


Fig. 61. The Egg Tester.

1. Egg-testing box.
2. Hole through which light shines and before which egg is held to be tested.
3. Chimney.
4. Bottle of water placed between light and No. 2.
5. Reflector to be placed behind light.

An ordinary lamp or electric light is placed in the box so that the light shines through No. 2. The bottle of water condenses the light, which makes the testing of eggs a comparatively simple matter.

Fig. 60.—Grades of Fresh gathered eggs.

Some people hold their September and Early October eggs, and then ship them later in the year to a dealer as fresh eggs. They, of course, expect the top price for new laids. Please do not believe you can deceive the dealer. By candling the eggs, which he always does, he can tell fairly close what your eggs are like as to age, etc.

Do not sell infertile eggs that are removed from the incubators as being good eggs or good food.

Do not allow the male bird to run with the hens after June 1st.

Do not keep the eggs in damp or musty cellars, boxes, or baskets.

Do not leave the eggs sitting in the sun, and if your grocer keeps eggs in his store window in which the sun shines, please ask him to remove them, unless he wishes to hatch chickens.

Do not sell eggs from found nests.

Practically all dealers have now agreed to pay for eggs according to quality. If your dealer pays as much for all kinds of eggs as he does for your good, clean, large sized, non-fertile eggs we will try to put you in touch with dealers who buy on a quality basis.

Kill the rooster after June 1st.

Candling Eggs.

Eggs are candled very easily. See Fig. 61. A new-laid egg, when held between the eye and the light, has a clear appearance, the yolk is practically invisible, and the air cell is about the size of a five-cent piece.

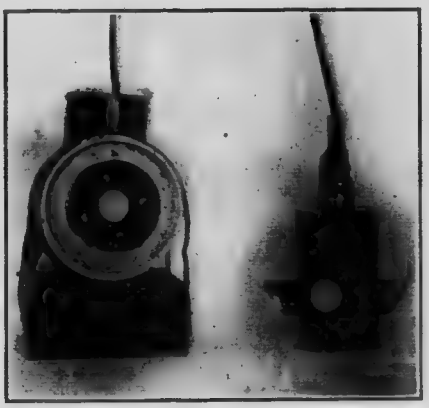


Fig. 68. Two types of commercial egg candles.

Unless the eggs are put in pickle or held in cold storage, the air cell gradually increases in size, and the yolk becomes visible.

Cold storage and pickled eggs may have small air cells, but the yolks are conspicuous.

Fig. 62 is a photograph of a new-laid egg. It will be noticed that all portions of the egg are similar in appearance. There is a very small air cell at the large end of the egg which does not show in the photo; this air space is not larger than a five-cent piece.

Fig. 62.

Fig. 63.

Fig. 64.

Fig. 65.

Fig. 66.

Fig. 67.

Fig. 63 is a photograph of a held egg, or one that is suitable for baking purposes, but not for boiling or packing. Notice that the yolk is conspicuous and the air space is very large. Pickled eggs usually show a conspicuous yolk but a small air space. Eggs that are two weeks of age usually show the yolk, and have an air space about the size of a twenty-five cent piece.

Figs. 64, 65, 66 and 67 are photographs of what the dealers term "spots," as they show various growths of moulds in the egg. These eggs are not rotten, but when opened smell musty. The mouldy portions are usually easily seen.

POULTRY HYGIENE AND SANITATION.

There is very great doubt in the minds of the writers of the advisability of "doctoring" sick chickens. The unit of production (the individual bird) is so small that if a man's time is worth anything it will not pay him unless he considers the bird especially valuable. The "cured" bird will always remain a menace to the flock, and with the slightest adverse conditions will show a return of the disease. Disease of any kind usually weakens the constitution of the individual, and hence lowers their breeding value. In such simple diseases as indigestion, colds, etc., where the greater part of the flock is affected and the flock can be treated as a unit, treatment is, no doubt, advisable. Where the birds are kept for the production of eggs and meat only, the hatchet will be found the safest and most effective method of treatment for individuals.

Prevention is better than cure, and every effort on the part of the poultry keeper should be exerted to maintain such environmental and sanitary conditions as to prevent disease gaining a foothold in the flock.

The stock which is used for breeding purposes should be selected first for *constitutional vigor,* as this is the foundation upon which the breeder must build future success. Discard all birds which have at any time been sick, and cull very closely birds which, as chicks, were raised in closely confined quarters.

The housing of the birds is very important in the prevention of disease. Abundance of fresh air and sunlight in the house, without draughts or dampness, will do much in maintaining a healthy flock. Houses must be kept sanitary by frequent removal of droppings and litter, as the latter becomes soiled. At least once during the year, preferably about the month of August, the house should be thoroughly cleaned and disinfected. All movable fittings, as nests, hoppers, and roosts may be removed from pen to facilitate cleaning. Thoroughly scrape dropping-boards, if used; remove all litter from floor, and then brush down ceiling and walls with a broom. The house is now ready to be disinfected. The writers find it advisable to apply a coat of whitewash to all pens once a year to brighten and help cleanse the pens. They have also found it most economical to combine the whitewashing and disinfecting processes by adding the disinfectant to the whitewash. The whitewash is made by slacking fresh stone lime and adding sufficient water to dilute to a creamy mixture. To this is added ten to fifteen per cent. of crude carbolic acid or some of the tarry compounds used for disinfecting purposes, and the whole applied with a hand spray pump. A pump capable of developing a fair amount of pressure is desirable, as it forces the solution into all cracks and crevices about the building. Applying with a whitewash brush is not to be recommended, as there is not sufficient penetration. Such materials as salt and cement, which are used by some to give sticking power to the wash, are not here

used. Nests, roosts and other movable fittings are best treated by dipping in solution of the wash or may be sprayed, but the dipping is to be preferred. Be sure to strain all whitewash before using in spray pump.

The land upon which birds are running must receive close attention in order to keep it clean and sanitary. Constant ranging over a piece of land by birds tends to foul the land, making it "chicken-sick." The heavier the soil the more serious is the trouble. Aim to cultivate the run or yard at least once in the year and grow a crop of grain or rape on it. This tends to cleanse the soil of droppings and at the same time produces succulent green feed for the birds.

The food must be closely attended to and no food given the birds which is musty or mouldy or where putrefaction has started. Only the purest and most wholesome foods should be used, as there is not only the ill-effect on the health of the birds, but seriously affects the produce from the flock.

Exercise is very essential to health, and this applies to chickens just as much as to other classes of stock. This is very important in the winter months, especially if one wishes to secure good hatches of strong, vigorous chicks.

In case of sickness, isolate all sick birds from the flock and either treat or destroy. All dead birds should be disposed of by burying deeply (two to three feet) or burned; the latter is the safer method of disposal.

Birds which are badly infested with vermin, such as lice or mites, will not thrive. If the vermin are not kept under control they will in time become so bad as to seriously lower the vitality of the birds, thus rendering them more susceptible to disease attack.

POULTRY DISEASES.

It is seldom that the external symptoms are so strongly marked as to present conclusive proof of the type of disease affecting the bird or flock. It is, therefore, necessary to conduct a post-mortem examination of diseased specimens. This is easily done. Place the dead bird on its back on a table or bench, and spread the legs apart, pressing them down flat on the table. Open the body of the bird just back of the point of the keel bone, after which cut the ribs along both sides of the body up to the front of the keel. Next, take hold of the back point of keel, raise it, and bend it forward with sufficient force to break the remaining attachment at the fore part of the body, being careful not to disturb the internal organs. It will now be possible to view the liver, heart, gizzard, and a portion of the intestines before moving any of the organs. Next, raise the liver and gizzard, placing them to one side. The gall bladder and spleen will be noticed on the under side of the liver, while the lungs will be found forward and closely attached to the back along the ribs. The moving of the gizzard will disclose the intestinal tract, which, if removed, will reveal in females the ovaries and oviduct. Examination of each organ should be made and the condition noted, the external symptoms being also considered in determining the nature of the disease present. While this examination may indicate the presence of a certain disease, one cannot be absolutely certain without a bacteriological examination.

Tuberculosis. This disease is very widely distributed throughout the Dominion of Canada. In some sections flock infections are much more serious than in others. Practically all classes of birds, with the exception of ducks, have been known to contract the disease. It is found, however, chiefly confined to adult birds. Very rarely, if ever, is it found in young chicks.

For a complete description of this disease, its dissemination and control, the reader is referred to Bulletin 193, "Tuberculosis of Fowl," by S. F. Edwards, M.S., formerly Professor of Bacteriology at the Ontario Agricultural College. This bulletin may be secured from the Ontario Department of Agriculture, Parliament Buildings, Toronto.

Blackhead.—This is a contagious disease affecting turkeys and fowl. It is quicker acting and more often fatal in the former than in the latter. It affects the liver and intestines, especially the blind pouches or ceca of the latter. In many sections of the country, where once turkeys were grown extensively, they are now seldom ever seen, due to the presence of this disease.

Young turkeys from two weeks to three or four months old are most frequently affected by the disease. The affected birds become mopy and show loss of appetite. In the more advanced stages the wings droop, and the head assumes a darkened or black appearance. Post-mortem examination will reveal enlarged and congested condition of the ceca with cheesy matter, while the liver will show the development of yellowish spots, which are slightly depressed in the centre.

Treatment of diseased birds has never proven successful. Preventive measures to control the outbreak and spread of the disease should be adopted. If purchasing birds or eggs for hatching be sure they come from healthy stock. Wipe hatching eggs with cloth wet in 80 to 90 per cent. alcohol and hatch in incubator if possible. Rearing on fresh ground, keeping old or wild birds away, disinfecting houses, etc., frequently, and killing and burning all diseased birds will do much to control attack of the flock. Some maintain that the use of an acid-drinking solution, such as sour milk or buttermilk, will assist in preventing the spread of the disease. If the milks are not available the addition of one dessertspoonful of muriatic or hydrochloric acid to one gallon of drinking water will accomplish the same purpose. It is now believed by some that the disease can be largely controlled by close regulation of the ration to prevent over-feeding during the first ten weeks of the young poult's life.

White Diarrhœa of Chicks. When chicks are about twenty-four to ninety-six hours old they resemble each other very much in appearance, with the exception that we have noticed that hen-hatched chickens and chickens hatched in moist incubators were longer in the down, or looked larger and fluffier. The trouble generally begins about the fifth day. Some of the chicks will have a thin, white discharge from the vent; the chick is not active, and has a sleepy look; also the head appears to settle back towards the body. One thinks the chick is cold or in great pain. Some of the chicks get in the warmest spot under the hover; others have intense thirst. The white discharge from the vent is not always present. The chicks may die in large numbers between the fifth and tenth days, or there may be a gradual dropping off each day until they are six weeks of age. The disease kills some quickly; others linger for a week or more. A few chicks appear to recover, but seldom, if ever, make good birds. They are small, unthrifty, and are good subjects for roup or any other epidemic.

To the ordinary observer a post-mortem examination may reveal any or all of the following conditions: The lungs will usually show small white spots in them. These are generally quite hard and cheesy. These spots are not always present, but from our examination I would judge they are in fifty per cent. of the cases. Some lungs have no white spots, but are red, sometimes fleshy. These, in our experience, are not very common, unless the chickens are chilled. The yolk is often hard and cheesy. It varies greatly—some yolks are of a gelatinous nature or almost like the white of the eggs; others are hard and cheesy and very yellow in color, sometimes these are greatly inflamed; other yolks appear like a

custard that has curdled, and they usually have a very offensive odor. The ceca, or blind intestine, is frequently filled with a cheesy substance.

The white spots in the chicks' lungs are generally considered to be due to the growth of a common mould. This may be in the eggs, or more frequently comes from mouldy feed or litter. It is much more troublesome in damp, dull weather, when the chicks are most inclined to stay under or near the hover.

Chicken-pox. A contagious disease of poultry which usually affects those parts of the head and face which are bare of feathering. The disease seldom affects birds which are not fully mature. It usually appears as warty nodules scattered over the face and about the eyes and mouth and over the comb, as shown in Fig. 70. In advanced stages of the disease other parts of the body may show development of the nodules.

The disease spreads rapidly from contact. Wild birds and parasites may serve as carrying agents, and thereby assist in spreading it among the flock.

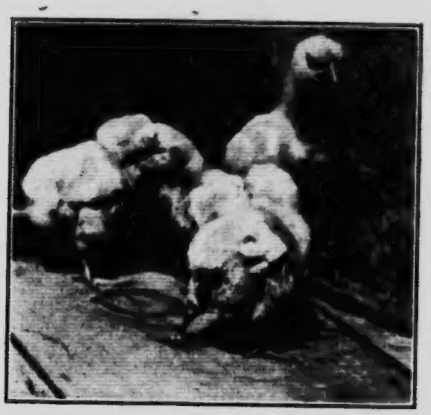


Fig. 69. Showing young chicks affected with White Diarrhœa.

Fig. 70. A typical case of Chicken-pox.

Buying in birds coming from diseased flocks, or it is sometimes carried by birds from the showroom.

In attempting treatment observe precautionary measures to prevent spread or incubation by carriers. Isolate diseased birds; remove crust of nodules; and treat with creolin (2 per cent. solution) or corrosive sublimate $\frac{1}{1000}$ and dusted with iodoform. It may also be treated by swabbing the affected parts twice per day with the following simple remedy:

Common table salt	1 teaspoonful.
Vinegar	1 teaspoonful.
Carbolic acid	1 teaspoonful.
Boiled water	1 pint.

Fowl Cholera. It is a virulent, usually fatal, and highly infectious disease. While rather common in Europe, it is not so prevalent in this country, although investigations show it to be on the increase here. It is a bacterial disease affecting all kinds of birds. The disease may be acute, in which case birds die in a few hours, or it may be sub-acute, the birds lingering for several days.

The earliest indication of the disease is the yellow coloration of the urates, which, normally, are white. This may be tinted with yellow as a result of other disorders than cholera. The urates is the chalky discharge on the droppings, and

is excreted by the kidneys. While this yellowish coloration is not absolutely certain proof of the presence of cholera, it should be taken as a warning and the birds showing the condition isolated. The excretion of the yellow urates, which later changes to a bright emerald green, is accompanied with more or less diarrhœa, which consists largely of colorless mucus. The bird isolates itself from the balance of the flock, the plumage becomes roughened, the wings droop and the head is drawn down to the body. They become very weak, the crop is distended and the birds show intense thirst.

Post-mortem examination reveals an inflamed condition of the digestive organs, kidneys, and mesenteries.

The disease is transmitted by contact with infected birds and drinking water used by an infected flock. Occasionally apparently healthy birds may serve as carriers, yet never show any outward ill-effects from its presence.

The only satisfactory method of treatment is to kill and burn diseased birds. In killing, do not draw blood, as this is heavily charged with bacteria, and might serve to infect the whole flock. Clean up and thoroughly disinfect all buildings and equipment, and cultivate the runs or yards thoroughly and frequently. Those birds which appear to recover from the disease should be killed and marketed to prevent them acting as chronic carriers of the disease, causing infection, and later on outbreaks.

Roup. This is a contagious catarrh attacking the membrane lining the eye, the sacs below the eye (*infra-orbital sinuses*), the nostrils, the larynx and the trachea.

The disease, which is aggravated by cold, wet fall weather, is first indicated by a watery discharge from the nostrils. In a few days this becomes thick, obstructing the breathing. The birds become listless and mopy, the wings droop and the head is drawn in to the body, while the birds show a decided loss of appetite. The inflammation, which begins in the nasal passages, soon extends to the eyes. The lids become swollen and glued together by the accumulated secretion. The viscosity of the discharge from the nostrils and eyes increases until they become completely closed, and the secretions become thick and cheese-like, producing swellings which continue to increase in size as the disease becomes more firmly established.

The course of the disease is usually of long duration. Where swellings occur about the head the case usually becomes chronic. Birds may become affected with the disease, but not at any time severely enough to be serious, yet may act as a carrier and source of infection to the flock at all times. Once introduced, it may remain in the flock for years.

While the specific organism or organisms which cause the disease are not certainly known, its infectious nature is well established. It is probably carried from one individual to another in the flock by the particles of dried secretion in the air or possibly by the food and drink contaminated by diseased birds. It may also be carried on the clothing or utensils.

Treatment.—Prevention is better than attempted cure. Be careful in introducing birds from other flocks. Isolate all sick birds, and aim to keep the flock as healthy as possible, thus rendering them disease resistant.

In case of infection, individual treatment is necessary, and as the possibility of obtaining a complete cure is very slight, it is, therefore, not advisable to attempt treatment unless the bird is a particularly valuable one. Potassium permanganate may be used in the drinking water to help prevent the spread of the disease. Treat infected birds by immersing the head in a solution of potassium permanganate

for twenty to thirty seconds. This should be preceded by a massage of the head, applying pressure with the thumb and forefinger on the nostrils in the direction of the beak two or three times. If tumors are present, however, a cure is practically impossible.

Internal Parasites. They are present in the intestines and ceca in small numbers in almost all birds. Normally they do not cause trouble, but under certain conditions, however, they become so numerous as to be serious. In such cases they affect the digestion and cause diarrhœa. In such cases they may become rolled into balls in the intestines, causing complete stoppage of the same.

In treating for worms a simple remedy to use is oil of turpentine. This may be given at the rate of one-quarter to one-half teaspoonful, to which is added about an equal amount of sweet oil. Follow this in two or three hours with a teaspoonful of epsom salts. In a week or ten days repeat the treatment if necessary.

External Parasites—Lice. There are several varieties of these, which are more or less common on hens. They seldom leave the body of the bird, so that

Fig. 71. Showing swelling about the eye, a common condition in cases of roup. There is almost an entire absence of discharge from the nostrils in this case.

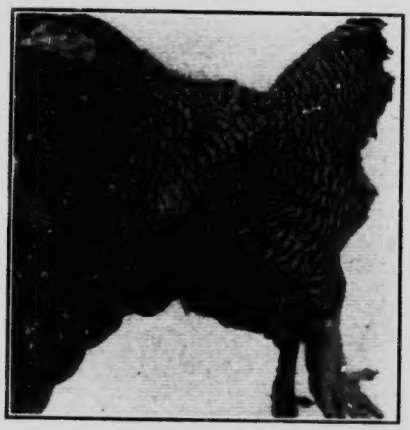


Fig. 72. Bird showing a bad attack of Scaly Leg Mite.

treating it is necessary to treat for the parasite on the bird. The common method of treatment is to dust the bird's plumage with insect powder, although in some cases applying Blue Ointment to the fluff and under the wings, or even dipping the birds in some of the prepared dips. The first two are the most satisfactory as the dipping is liable to cause colds unless the birds are thoroughly dried in a warm room.

Possibly the most satisfactory lice powder to use is one invented by Mr. R. C. Lowry, formerly of Cornell University. It is made as follows:

Take 3 parts of gasoline and 1 part of carbolic acid, 90 to 95 per cent. strength. Mix these together and then add gradually, by stirring, enough plaster of paris to take up all the moisture. It will take about four quarts of the plaster of paris to one quart of the liquid. After stirring sufficient to insure thorough mixing spread out and allow to become perfectly dry. If the proper strength carbolic acid cannot be secured the same quantity of cresol may be used.

Next to the above, pure pyrethrum or Persian insect powder will be found as cheap and effective as any.

In using any powder or treatment for lice one application is not sufficient to free the birds of the parasites, as there are the unhatched eggs which are not affected by the application. The treatment should be repeated in about ten days and a third application given if necessary.

With young chicks, lice, if present, are usually found on the top of the head. The only safe and satisfactory treatment is to apply grease, such as lard or vaseline, to the top and back of the head with the finger. The addition of sulphur to the grease is sometimes recommended, but should not be used on young chicks.

Mites. The most common variety is the fowl mite or red mite. They visit the birds only to feed, usually at night, and spend the rest of the time on the under sides of the perches, in cracks or crevices, or in collected droppings, or other filth that may be allowed to accumulate about the house. They breed in such places as mentioned above and reproduce very rapidly, especially in the hot spring and summer.

Fig. 73. A good type of spray outfit for a poultry plant.

Treating for mites consists in first thoroughly cleaning the house, removing all droppings, litter and nesting material. Then thoroughly spray with a five per cent. solution of cresol, using sufficient force to get good penetration into the cracks and crevices. Repeat this if necessary. Treating the roosts with kerosene at intervals of two weeks during warm weather will assist in preventing spread of the parasites.

Scaly Leg. The mites producing this condition excavate places under the skin where they live and breed. The irritation produced by the presence of the mites under the skin induces a discharge from the surrounding tissue which solidifies. Increased secretions raise the skin of the legs, producing the rough, scaly condition. The raising of the skin enables the mite to burrow further into the tissue, thereby aggravating the scaly condition.

Individual treatment is necessary. It consists of the application of some penetrating oil to the infected parts. Immersing the shanks in kerosene or a five per cent. solution of cresol, anointing the parts after each immersion with lard or vaseline, will usually effect a cure.

(NOTE.—In the preparation of the foregoing work on diseases the publication " Diseases of Poultry " by Pearl, Surface and Curtis, has been used extensively, for which credit is hereby given).